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Technological changes in the railway industry: Employment effects and adjustment process CPR Angus workshops, Montreal. 1967.

TECHNOLOGICAL CHANGES
IN THE RAILWAY INDUSTRY:

# Employment Effects and Adjustment Process

CPR ANGUS WORKSHOPS, MONTREAL



Economics and Research Branch
CANADA DEPARTMENT OF LABOUR

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# Employment Effects and Adjustment Process

## CPR ANGUS WORKSHOPS, MONTREAL

Economics and Research Branch
CANADA DEPARTMENT OF LABOUR

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# FOREWORD

This publication is the second in a series of three reports to be issued by the Canada Department of Labour on the subject of technological change in the railway industry in Canada and the ways in which workers have adapted to change.

All three reports were initiated under the former Research Program on the Training of Skilled Manpower of the Department of Labour, in co-operation with other federal and provincial departments and management and union organizations.

The first report, prepared by Mr. P.R. Schweitzer, was a broad study of technological change in railway operations in the Maritime Area of the Canadian National Railways. It was published in October 1964 as Report No. 12 in the Skilled Manpower Training Research Program series of publications under the title "Technological Changes In The Railway Industry: Maritime Area of C.N.R."

The present report focuses on railway shops, where the impact of technological change has been particularly heavy. It presents the findings of two surveys conducted by Dr. C. Glyn Williams at the C.P.R. Angus Workshops in Montreal. The first survey, undertaken in the summer of 1962, was concerned with the employment and occupational effects of technological change in the Angus Workshops and in the C.P.R. system as a whole. The second survey, carried out during the summer of 1963, dealt with the employment adjustment process.

The report was written by Dr. Williams under the supervision of Mr. Phillip Cohen of the Economics and Research Branch of the Department of Labour. The summaries of Parts I and II of the report were prepared by Mr. Cohen in co-operation with the author. The whole study was carried out under the general direction of Mr. J.P. Francis, formerly Director of the Economics and Research Branch and now Director of the Planning and Evaluation Branch, Department of Manpower and Immigration. The report was edited and prepared for publication by Mr. R.A. Knowles and Mr. A. Jones, now with the Department of Manpower and Immigration, in consultation with Mr. Phillip Cohen.

The third report, scheduled for publication shortly, is being prepared by Mr. John Millons of the Economics and Research Branch, Department of Labour. It is a case study of the industrial relations aspects of technological change at the Angus Shops, with particular emphasis on those features of collective agreements and of union and management policies and practices that have either facilitated or impeded the adjustment of workers to technological change.

The three studies together provide a comprehensive picture of technological change and the employment adjustment process in one of Canada's major industries. The findings that have emerged will provide, it is hoped, useful guidance to management and labour in their efforts to resolve similar problems that arise.

The Economics and Research Branch gratefully acknowledges the co-operation of Canadian Pacific Railway officials in making this second study possible and in providing ready access to unpublished data. The co-operation of the unions comprising Division No. 4, Railway Employees Department, A.F.L.-C.I.O., in making freely available all the information at their disposal relevant to the study is also gratefully acknowledged.

John Mainwaring,
Acting Director,
Economics and Research Branch.

December 1967.

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## Introduction

This report attempts to evaluate the technological changes in one railway shop--namely Angus Workshops in Montreal--since 1948, the changes in employment, and the labour force adjustment process over the same period of time. The Angus Workshops are owned and operated by the Canadian Pacific Railway Company. It is one of three main repair shops at which the major repairs and overhauls of CPR rolling stock are carried out, and its importance in the maintenance of equipment sector of CPR operations is reflected in its average employment which, in 1961, amounted to 3,482 maintenance of equipment employees (or 28.2 per cent) of the 12,362 maintenance of equipment employees in the whole CPR system.

The main objectives of the study were to establish a quantitative association between the different technological changes and the employment changes (or, at least, to ascertain the degree of qualitative association between the two) and to determine and describe--in so far as the data would permit--the employment adjustment process both within the Angus Workshops as well as the employment adjustment mechanism between the Angus Workshops and all the other outside CPR establishments.

Part I of this report covers the first area of analysis. Part II deals with the employment adjustment process.

This is not a study of general technological unemployment resulting from the technological changes that have occurred in the railway workshop: to do this would necessitate an examination of companies and plants in which employment has been generated by the changes in the sector under observation. Neither does it examine all technological changes that have influenced employment in Angus Workshops. A study of that magnitude would need to regard all technological changes as having some influence on all economic sectors--even though their impact on most of these sectors could be regarded as negligible. In a sense, therefore, this study lacks precision in that its scope is too narrow to answer certain vitally important questions, viz., the impact of changing technology in one sector on employment in general, and the impact of changing technology in general on employment in one sector. However, it is hoped that with all its limitations, this report will help to advance our knowledge of the relationships between technological changes and changes in employment and of the adjustment process mechanism in meeting the employment changes.

# PART I

# TECHNOLOGICAL CHANGE IN RELATION TO EMPLOYMENT CHANGE

## Chapter 1

## The Nature and Meaning of Technological Change

In this report, the term 'technological change' means a change in techniques of production to meet a given quantity and type of service needed by consumers and intermediate producers. These service needs are the passenger and freight services demanded by consumers which, in this case, will constitute a final demand, and the passenger and freight services demanded by producers as intermediate services in the production of final goods.

This definition covers more than strictly technological factors. For example, it includes non-technological, organizational changes which are related to mechanical changes. Other organizational changes are relevant even though they do not stem directly from mechanical developments.

Mechanical changes refer to the introduction of new equipment, new types of power or new materials into the workshop or the expanded use of these productive factors. In this way, it is practicable to include under one broad heading the changes which have occurred in the railway workshop, in the equipment used in the repair and maintenance of railway rolling stock, and in the rolling stock which is brought into the shops for repair and maintenance.

It should be emphasized that the preciseness of this definition of technological change is reduced to the extent that the actual service provided is changed. For example, the trans-Atlantic, streamlined, service dome-trains provide an additional service compared with that of the earlier passenger cars. There may be many examples of such changes in type of service rendered. However, they are assumed away on the grounds that the basic function of a railway system is that of transporting people and goods. Qualitative changes in any type of service rendered are covered by one definition, since they are reflected in input requirements and, hence, in prices paid per unit of service rendered, assuming competition throughout the price structure.

Organizational changes are those designed to provide more efficient use of existing equipment. In some instances, such changes may arise from the simple realization of a more effective method of using resources to produce a given product. In other instances, they may stem directly from the introduction of particular mechanical changes, e.g., the concentration of major maintenance work which has been made possible through the dieselization of railway motive power.

Other specific changes will be referred to briefly, e.g., the displacement of labour through the expanded use of some factor other than the resources already referred to. This would cover such changes as an alteration in the production techniques to provide for a greater volume of managerial services, making possible a reduction in the amount of labour required for the same output of transportation services. For example, a movement from piecework which has proved to be uneconomic to a system of time rates will almost certainly increase the supervisory staff required when the incentive bonus is removed. Moreover, such changes may be related to mechanical changes, although this is by no means sure. Nevertheless, their irregular introduction makes it extremely difficult to isolate their labour-displacing effects, and such

effects will be no different from the effects of the purely technological nature with which this study is primarily concerned.

It is practically impossible to discuss all the technological changes that affect the level and occupational composition of employment in any particular sector of the economy. Not only are there persistent changes in that sector of the economy which directly affect employment, but changes are also continually occurring in other sectors which indirectly, but no less significantly, affect the particular sector under observation. This holds just as true for railway workshops. The following are the types of technological changes likely to affect the level and composition of employment in a particular railway workshop:

A. Direct:

1. Changes in equipment (machinery, tool and construction materials) used in the repair, maintenance and building of railway rolling stock and other items of manufacture such as frogs and track work specialties.

2. Changes in the equipment (rolling stock) worked on so that a particular level of freight or passenger services can be provided on a changed maintenance base.

3. Changes in the organizational structure of repair and maintenance work as a result of changes in the equipment worked with or on, such organizational changes affecting production functions so that a particular level of freight or passenger service can be provided with different combinations of, as well as total inputs of, capital equipment and labour.

B. Indirect:1/

1. Technological changes in other industries which increase their capacity to compete with the railways and therefore tend to reduce the traffic levels of the railways at any given level of national output of goods and services.

2. Technological changes in other industries which serve to reduce their dependence on the railways for the carrying of freight and passenger traffic (e.g., technological changes which shift the centre of gravity of a particular industry's economic location and thereby reduce the transportation demand for the carrying of raw materials or finished product; or technological changes which alter the product significantly while not altering the service it provides so that, again, the transportation component in its manufacture is reduced).

3. Technological changes in industries which are not so dependent on railway services, and in which the changes serve to increase their competitiveness in relation to industries that do depend on railroad services in the accumulation of raw materials or distribution of final products. Here again, the demand for railroad services would be reduced.

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1/ Reference to changes in consumer tastes, which result in changes in consumer demands in relation to railway equipment, has been omitted.

Clearly, indirect changes cover an enormous range of phenomena in our industrially advanced economy, particularly in a period of rapid and widespread technological change. For example, they include better roads which stimulate the growth of inter-industry competition; mechanical changes in road transport, e.g., continental private telephone networks and multiple-unit auto-hauling trailers; the conversion from fossil fuels to petroleum and natural gas for power as price relativities have shifted over time in favour of the latter; and changes in raw materials, e.g., aluminum or plastics, which serve to increase their competitiveness in relation to steel.

These changes, though major and diverse, are, however, only those which are evident to the casual observer of industrial trends. Of great importance--although they may be less obvious--are the innumerable changes that occur in our dynamic economy as it adjusts to changes in availability of capital, developments in knowledge relevant to the industrial process, and to changes in relative scarcities of productive factors. Each of these affect the long-term structure of the economy.

In one sense, of course, the indirect repercussions of such changes on the level and occupational composition of employment in the railway industry in general, and in railway workshops or one such workshop in particular, to some degree appear similar to those brought about by changed consumer patterns. There may be a decline in the number of freight or passenger miles required, or a relative decline in the index of traffic growth compared with the other indices of economic growth, thus indicating that the railway industry constitutes a smaller part of the nation's economy than previously. In a broader study, for example one which dealt with the development and persistence of technological unemployment as a general economic phenomenon, it would be necessary to isolate the effects of technological change from the effects of changes in consumer patterns.

Of course, technological changes in the railway industry or railway workshops in turn also affect unemployment outside the workshop or industry. Reductions in employment levels in the one sector, directly affected by a change in technology, may be compensated for partly by an increase in employment in another sector, whose sales are augmented by the switch to a different organizational structure of building, repair and maintenance. Again, a broader study than this would need to take into account these influences.

However, this study does not have these wider objectives. It describes the employment changes at the Angus Workshops during the period 1948 to 1961, and the technological changes that have occurred in the Canadian Pacific Railway system which appear to have a bearing on these employment changes. It is believed that, between technological changes and employment changes, certain quantitative and/or qualitative relations may be validly asserted on a micro-economic basis.

The first phase of the study will be devoted to this limited aim. It would be easy to quantify the relations between technical changes and employment if the relations were simple, if the lags in employment effects of the changes were known and could be allowed for, and if the other employment determining factors remained constant or could be allowed for. None of these conditions holds true. The economic system is complex and in a constant process of movement or in David M. Wright's words, of "becoming". No industry remains immune from shifts in preference functions for any and all goods, or from shifts in their

production function. Differential growth ratios of labour and capital, shifts in demand towards or away from labour or capital intensive products, development of inventions which are non-neutral in their effects on the relative productivities of labour and capital are constantly occurring.

Part I, therefore, will be mainly concerned with changes in technology and techniques of production as they are found in the recorded data. These changes will be related to their impact on employment when it is felt legitimate to do so. It is emphasized that the conclusions drawn are qualified and tentative. Failure to draw any conclusions would indicate refusal to accept responsibility except in conditions of certainty and in this area certainty never exists.

Part II of the study is a description and analysis of the labour force adjustment process at Angus Workshop over the same period. Two adjustment processes are considered: the external and the internal. The external process considers movements between Angus and the rest of the economy. The internal process considers movements inside Angus, and in so doing assesses the degree of internal mobility between the seniority lists at the plant. A chapter is devoted to changes in the ratio of skilled to semi-skilled workers at Weston and Ogden shops. Here Angus was left for the latter shops because of the unavailability of data for the Angus shop on this topic. Finally, some boilermakers at Angus were interviewed to gain an idea of their lay-off experience. The findings are given in a final chapter.

## Chapter 2

### The System Organization of Maintenance Work on Motive Power and Rolling Stock, 1948-1961

The Canadian Pacific Railway Company shop system is described in a book compiled and edited by the Canadian Pacific Department of Public Relations.[1] In 1946, the system had three main shops: Angus Shops (Montreal), Western Shops (Winnipeg) and Ogden Shops (Calgary). These shops were responsible for all major repairs to railway motive power and rolling stock. A considerable amount of locomotive and car construction work was also carried on at these shops.

In addition to the main shops, smaller locomotive repair shops were located on eastern and western lines. On the eastern lines, repairs were made to railway equipment at McAdam (New Brunswick), West Toronto and North Bay (Ontario), Lyndonville (Vermont) and at Kentville (Nova Scotia). On the western lines such repairs could be done at Fort William (Ontario), Brandon (Manitoba), Moose Jaw (Saskatchewan), Alyth, Calgary (Alberta), Revelstoke and Vancouver (British Columbia). Day-to-day servicing was done at terminal points, and as crews changed at division points so also maintenance and servicing crews were employed at these points.

Some indication of the changes that have taken place in the distribution of maintenance facilities over the system in the intervening years may be seen in Table 1, which sets out CPR maintenance of equipment employment in Manitoba in 1950 and 1961. A short discussion of Table 1 should be sufficient at this point to allay any fears that concentration and/or deconcentration of different aspects of equipment maintenance work would greatly reduce the value of an examination of one main repair shop.

On the locomotive repair side, the exception to major employment reduction is Winnipeg Roundhouse, where little change appears between the two years. The reason for this is to be found in the significant differences in maintenance patterns and requirements between diesel and steam locomotives. The longer runs by diesel locomotives between servicings have permitted concentration of shop staffs at fewer points. On the CPR, these servicing facilities are located at St. Luc Yard (Montreal), Chapleau (Ontario), Winnipeg Roundhouse, Alyth (Calgary) and Nelson (British Columbia). Steam locomotives, on the other hand, required servicing facilities every 100 to 125 miles. These facilities consisted of 'roundhouses' supplying varying degrees of repair. Diesel units require considerably less servicing and only after every 350 to 450 miles.

It is clear that there has been a shift in the locus of repair work. Where it is obvious that this shift is relevant to conclusions in this study, allowance will be made for it. Where the technological changes are system wide in their impact, the employment effects will be traced on a similar system basis. It might also be noted at this point that a high degree of correlation does exist between system employment figures and Angus employment figures.

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[1] H.B. Bowen: "Shop System", in: Canadian Pacific Facts and Figures, Department of Public Relations, Canadian Pacific Railway Company. Montreal: 1946, pp. 218-222.

Table 1

CPR Maintenance of Equipment
Employment in Manitoba in 1950 and 1961

| | 1950 | | 1961 | |
|---|---|---|---|---|
| | Loco. | Car | Loco. | Car |
| Weston main shop..... | 1,242 | 645 | 549* | 579 |
| Fort William - roundhouse.... | 95 | - | 57 | - |
| - shop..... | 30 | - | - | - |
| - electric..... | 9 | - | - | - |
| - power..... | 5 | - | - | - |
| - car..... | - | 106 | - | 150 |
| Ignace..... | 28 | 15 | 16 | 21 |
| Kenora..... | 97 | 31 | 21 | 41 |
| Winnipeg - roundhouse..... | 249 | - | 230 | - |
| - power plant..... | 26 | - | 14 | - |
| - coach yard..... | - | 184 | - | 114 |
| - running yard..... | - | 153 | - | 199 |
| St. Boniface..... | 5 | - | - | - |
| Portage..... | 3 | 1 | 1 | - |
| Brandon..... | 104 | 35 | 34 | 39 |
| Broadview..... | 29 | 12 | 17 | 14 |
| Minnedosa..... | 25 | 6 | 7 | 5 |
| Bredenbury..... | 12 | 5 | 7 | 3 |
| Souris..... | 21 | 8 | 7 | 6 |
| Napinka..... | 2 | - | 1 | - |
| Arcola..... | 4 | - | 1 | - |
| La Riviere..... | 3 | 1 | 2 | - |
| Neudorf..... | 2 | - | 1 | - |
| Miscellaneous..... | 12 | 3 | 3 | 1 |
| | 2,003 | 1,205 | 968 | 1,172 |

* 71 diesel electric maintenance employees and 478 store order and work equipment employees.

Organization of Work Within Angus Workshops 1948-1962

Angus Shops (as at 1946) are described as follows in Canadian Pacific Facts and Figures:

> "They consist of 23 separate buildings comprising a locomotive repair shop, four passenger car repair shops contained in two larger separate buildings with a transfer table operating between them, two large freight car repair buildings, one housing mainly machinery units used in steel freight car repairs or construction work and the other the assembly line for heavy repairs to so-called 'house' cars more commonly known as box, refrigerator, stock and similar. A cast iron wheel foundry, a general castings foundry, a frog and track switch repair shop, a bolt and nut manufacturing shop, a very large blacksmith shop, a truck repair shop, a car metal working machine shop, a large wood mill, an electrical repair shop, a cabinet and varnishing shop, a brass machine and tinsmithing shop, an upholstery repair shop, a very large general store, a plant hospital and police building and a modern general office and administration building. There is also a Test and Inspection Department and open freight car repair tracks accommodating some 1,000 freight cars. A new and modern scrap and reclaim dock, a shot blast building, replacing the former sand blast plant used for cleaning steel equipment and a large new locomotive boiler repair shop are now under construction at the Angus plant."

As to the output potential at Angus, the writer goes on to say:

> "Approximately 30 classified locomotive repairs and five new locomotives can be turned out monthly at the locomotive shop. One thousand passenger cars are shopped annually at the passenger car shops and in addition there is capacity for an output of 10 new passenger cars per month. The freight car shops have a capacity for 100 shop repairs per day and 15 new freight cars, and together with the freight repair tracks, now turn out around 15,000 freight car repairs per annum. The wheel foundry has a capacity for 320 cast iron wheels per day and turns out between 70,000 and 80,000 cast iron wheels per annum. The general casting foundry has a capacity for close to 19 tons of castings per day and turns out between eight and nine million pounds of castings per annum."

If this description were to be rewritten today, the new text would provide some idea of the types and impact of the changes in the use of transportation media and technology, both of which have affected the maintenance of equipment sector in the post-war years. Most significant perhaps would be the reduction in the plant capacity now working on passenger car repairs--where floor capacity of one-quarter the 1948 volume serves to meet a passenger service which has declined by 50 per cent over this period.

The cast iron wheel foundry is no longer operating, having been closed in 1960 as the advantages of purchasing steel wheels from outside firms came to be realized. A contributory reason for the closure originated in the ruling of the Association of American Railroads that all traffic in interchange between Canada and the United States should be equipped with steel wheels. This decision, of course, was based on the greater inherent safety of steel and the need to introduce steel equipment suited to the stresses imposed by increases in train speeds and weight.

In addition, it was estimated to be more economical to buy steel wheels from outside companies than to manufacture wrought steel wheels at Angus.

The Cabinet Shop is now consolidated with the lumber mill in the interests of machine operating efficiency, largely because of the decline in work volume.

The reclaim dock has been greatly expanded as shifts in relative prices and changes in reclaiming techniques have made reclaiming more profitable and practicable.

The Locomotive Millwright Shop is now a part of the Locomotive Shop, a result of the reorganization necessitated by the conversion over this period from steam to diesel motive power and the very significant decline in the number of locomotive units requiring maintenance.2/

Finally, the Car Electric Shop has been greatly expanded over the period, a result of the increase in electrical fittings in the newer passenger cars and the large and heavier generators that have to be carried. The significance of this expansion is especially marked in view of the large reduction that has occurred over the period in the total number of passenger cars in service over the system.

Within the Locomotive Shop the process of dieselization has led to a complete reorganization of its internal structure. The disappearance of the Tender Shop and the Brass Shop are as symptomatic of the conversion from steam to diesel as the appearance of the Diesel Erecting Shop and the Locomotive Electric Shop (see Tables 13, 14, 15, 16). The introduction of the Air Brake Shop and Air Compressor Shop stems from the concentration in the Locomotive Department of the smaller shops from the Car and Locomotive Departments. This concentration was prompted by a reduction in rolling stock and motive power units and the installation of a conveyor belt system with impact wrenches for faster repair of components.

Many factors have impinged upon plant layout and organization. But in terms of significance, of course, the employment changes are a far better indicator of output changes and more in line with the topic of this report than is the brief description which is possible here of changes in plant layout. The employment changes will be discussed in the next chapter.

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2/ This decline is a result of both the reduction in passenger miles now provided compared with 1948 and the greater efficiency of diesels compared with steam in the provision of motive power. Changes in the organization of maintenance work over the period are also contributory reasons.

## Chapter 3

## Long-Term Employment Trends

Summary

Total employment in the CPR has declined significantly in the post-war years. From 1948 to 1961 it has fallen from an annual average of 82,206 to 63,694 or by 22.5 per cent. From its post-war high in 1952 to 1961, employment has fallen from 90,619 to 63,694 or by 29.7 per cent.

Over the period 1948-1961, maintenance of equipment employment in the CPR fell from 17,623 to 12,362 or by 29.9 per cent. From 1952 to 1961 this employment category was reduced from 21,654 to 12,362 or 42.9 per cent. The higher figures for maintenance of equipment employment indicate both a greater downward trend and a greater instability in this category.

At Angus Workshop, employment declined from 6,208 in 1948 to 3,482 in 1961, a reduction of 2,426 or 43.9 per cent. Skilled workers were reduced in number by 1,319 or 44.8 per cent. Semi-skilled worker employment fell by 913, or 52.4 per cent. Unskilled workers fell by 446 or 37.4 per cent. Clerical and supervisory workers fell by 48 or 14.6 per cent.

This differential reduction in the employment of the skill groups at Angus has some implications for the trend in the degree of skill of the work at Angus. The increase in ratio of skilled to semi-skilled workers suggests an increasing skill trend. This is only a tentative conclusion and in this and in a further chapter (Chapter 2, Part II) this conclusion is discussed in some detail.

### Employment Trends - CPR

The significant decline of total employment in the CPR in the post-war years may be attributed in part to the growth of competition from other forms of transportation and to technological change. Moreover, as Table 2 shows, the downward trend has not been steady over the whole period. In 1949, 1952 and 1956, cyclical peaks may be seen, but the succeeding troughs show a constant lowering of the employment level and from 1956 onwards, the downward trend has been unbroken.

In addition to the significant decline in total employment and maintenance of equipment employment over the period, Table 2 illustrates the greater cyclicality of the latter. This may be explained by the greater possibility that exists for postponing maintenance work in general than in the direct production of transportation services. However, even with 1948 as the base, a decline of 30 per cent in maintenance of equipment employment indicates the presence of strong forces acting upon the industry.

These forces are partly made up of effective competition working to the disadvantage of the CPR (in terms of size). This may be seen in Appendices 4-6, Part I, which show how the railways are failing to participate fully in the growth of the transportation needs of the expanding Canadian economy. While the Gross National Product (measured in constant 1949 dollars) has increased by 69 per cent between 1947 and 1961, the index of inter-city revenue ton-miles carried by all Canadian railways has increased by 8.8 per cent, the CPR's share in this traffic being only 1.0 per cent. Although, in passenger service, inter-city

passenger miles travelled have increased by 159.8 per cent between 1947 and 1961, the number of passenger miles carried by all Canadian railways has fallen by 34.9 per cent. Meanwhile, revenue passenger miles carried by the CPR have fallen by 49.8 per cent.

It is against such a pattern of non-growth (in freight services) and of absolute decline (in passenger services) that the process of technological change in the railway industry needs to be viewed. For, in almost all recorded cases of such change in the industry--and more certainly in the maintenance of equipment sector--the technological changes have been labour-displacing in character. New machines, new materials, new methods of organization of maintenance work have almost invariably reduced the number of men (or man-hours) required to provide a given number of motive power and car units. At the same time, new equipment and reorganization in direct production of railway services have reduced the number of such units needed in the production of a given volume of these services.

Table 2

Employment Trend - Total Employees and Maintenance of Equipment Employees - Canadian Pacific Railway, 1948-1961

| Year | Total Employment CPR* | Index | Total Maintenance of Equipment Employment, CPR | Index | Per Cent of Maintenance of Equipment Employees to Total Employees |
|---|---|---|---|---|---|
| 1948.. | 82,206 | 100.0 | 17,623 | 100.0 | 21.4 |
| 1949.. | 83,672 | 101.8 | 18,193 | 103.2 | 21.7 |
| 1950.. | 81,040 | 98.6 | 17,465 | 99.1 | 21.6 |
| 1951.. | 86,765 | 105.5 | 19,551 | 110.9 | 22.5 |
| 1952.. | 90,619 | 110.2 | 21,654 | 122.9 | 23.9 |
| 1953.. | 90,232 | 109.8 | 21,569 | 122.4 | 23.9 |
| 1954.. | 81,994 | 99.7 | 18,172 | 103.1 | 22.2 |
| 1955.. | 81,776 | 99.5 | 18,147 | 103.0 | 22.2 |
| 1956.. | 84,924 | 103.3 | 19,150 | 108.7 | 22.5 |
| 1957.. | 83,348 | 101.4 | 18,188 | 103.2 | 21.8 |
| 1958.. | 76,509 | 93.1 | 16,017 | 90.9 | 20.9 |
| 1959.. | 73,277 | 89.1 | 14,885 | 84.5 | 20.3 |
| 1960.. | 67,973 | 82.7 | 13,123 | 74.5 | 19.3 |
| 1961.. | 63,694 | 77.5 | 12,362 | 70.1 | 19.4 |

* Average of twelve monthly counts.

Source: Steam Railway Employees and Their Compensation, 1926 to 1951 and Railway Transport (Employment Statistics) Annual. Dominion Bureau of Statistics.

TABLE 3

Productivity Trends Based on Total CPR Employment and Total CPR Maintenance of Equipment Employment, 1948–1961

| 1<br>Year | 2**<br>Total Freight Ton-Miles (000) | 3**<br>Passenger Miles (000) | 4<br>Total Traffic Units* (Col. 2) + (Col. 3 x 2) (000) | 5<br>Total CPR Employment | 6<br>Traffic Units per Employee | 7<br>Total CPR Maintenance of Equipment Employment | 8<br>Traffic Units per Maintenance of Equipment Employee |
|---|---|---|---|---|---|---|---|
| 1948 | 27,461,692 | 1,523,514 | 30,508,720 | 82,206 | 337,125 | 17,623 | 1,731,188 |
| 1949 | 26,709,152 | 1,389,395 | 29,587,942 | 83,672 | 353,618 | 18,193 | 1,626,337 |
| 1950 | 24,932,541 | 1,242,279 | 27,417,099 | 81,040 | 338,316 | 17,465 | 1,569,831 |
| 1951 | 29,225,616 | 1,339,362 | 31,904,340 | 86,765 | 367,710 | 19,551 | 1,631,852 |
| 1952 | 31,438,892 | 1,377,309 | 34,193,510 | 90,619 | 376,229 | 21,654 | 1,579,085 |
| 1953 | 29,764,764 | 1,321,004 | 32,406,772 | 90,232 | 359,149 | 21,569 | 1,502,470 |
| 1954 | 25,361,394 | 1,282,242 | 27,925,878 | 81,994 | 340,584 | 18,172 | 1,536,753 |
| 1955 | 27,195,236 | 1,330,957 | 29,857,150 | 81,776 | 365,109 | 18,147 | 1,645,294 |
| 1956 | 32,165,235 | 1,309,575 | 34,784,385 | 84,924 | 409,594 | 19,150 | 1,816,417 |
| 1957 | 28,552,744 | 1,338,240 | 31,229,224 | 83,348 | 374,685 | 18,188 | 1,717,024 |
| 1958 | 27,802,016 | 1,149,159 | 30,100,334 | 76,509 | 393,422 | 16,017 | 1,879,274 |
| 1959 | 26,743,790 | 1,112,194 | 28,968,178 | 73,277 | 395,324 | 14,885 | 1,946,132 |
| 1960 | 26,451,824 | 1,008,106 | 28,468,036 | 67,973 | 418,814 | 13,123 | 2,169,324 |
| 1961 | 27,143,782 | 836,962 | 28,817,706 | 63,694 | 452,440 | 12,362 | 2,331,152 |

* The computation of traffic units on the basis of ton-miles plus twice the passenger miles is adopted here on the example of J.C. Nelson: *Railroad Transportation and Public Policy* (The Brookings Institution, Washington, D.C., 1959), p. 237.

** SOURCE: Annual Reports of the Canadian Pacific Railway

Part of the picture of these changes may be seen in a variety of indexes of productivity in the CPR. The indexes of average gross weight of freight trains and the average speed of such trains can be combined to provide the most comprehensive single indicator of freight train performance, namely, gross ton-miles per freight-train-hour. This is the average number of tons of cars and contents moved one mile in one hour by freight trains.[1] Between 1947 and 1959, this figure increased by 66.1 per cent.[2]

Table 3 shows the trends in productivity of total CPR labour and of total CPR maintenance of equipment labour. It will be seen that productivity in terms of traffic units per employee in CPR has increased over the period by 34.2 per cent, while the productivity of maintenance of equipment employees has increased by 34.7 per cent. An increase of this magnitude would necessarily reduce the number of employees required to maintain a given volume of railway traffic. Moreover, the fact that the actual traffic has also declined over the period adds to the adjustment problems which the industry has experienced.

Trends in the Record of Maintenance of Equipment Employment on the CPR 1948-1961

Changes in the traffic volume carried by the CPR and in the employment factor composition have not affected all departments of maintenance of equipment work equally, or even in the same direction.

This is illustrated in Tables 4 and 5. Taking the broad categories of foremen, skilled, semi-skilled and unskilled employees, the reductions that have occurred in employment of these groups on the CPR are 4.0, 25.0, 39.6 and 33.7 per cent respectively. Within these broad groups, it will be seen that (among the sub-groups whose employment in 1961 falls below 50 per cent of their 1948 level) blacksmiths (42.6), boilermakers (25.4), moulders (17.5) are included; and, raising the criterion to 60 per cent of the 1948 level brings carmen, coach and locomotive (56.9), machinists (58.1) and apprentices (52.1) into the categories greatly reduced over the period. Increases in employment in 1961 compared with 1948 are recorded for only two sub-groups: carmen, freight (102.0) and electrical workers (148.8).

These figures do not relate to the significance of each sub-group in the total reduction in staff over the period. This is because of the differences in the absolute number of employees in each class. Thus the reduction of 82.5 per cent in the number of moulders accounts for only 0.9 per cent of the total reduction in maintenance of equipment staff. On the other hand, helpers to mechanics, whose employment has fallen by 39.6 per cent, account for 26.0 per cent of the total reduction in staff. Other sub-group reductions which constitute a significant part of the total reduction are labourers (classified and unclassified) 20.7 per cent, and machinists 16.4 per cent.

Some conclusions may be derived from a study at this initial level of the relative influences of declining traffic and technological

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[1] Canadian Pacific Railway Company: Submission of the Canadian Pacific Railway Company to the Royal Commission on Railway Transportation in Canada (Montreal, 1960), pp. 2-3.

[2] Ibid., p. 3.

TABLE 4

CPR, Maintenance of Equipment Employment – Indexes

| Maintenance of Equipment Employment on CPR | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General foremen, foremen and assistant foremen | 100.0 | 104.3 | 103.2 | 112.7 | 122.3 | 123.4 | 117.0 | 113.0 | 110.0 | 111.3 | 103.6 | 101.4 | 98.6 | 96.0 |
| Skilled | | | | | | | | | | | | | | |
| Blacksmiths | 100.0 | 101.8 | 95.2 | 99.6 | 115.1 | 118.0 | 85.3 | 72.4 | 70.6 | 65.8 | 53.3 | 47.4 | 42.6 | 42.6 |
| Boilermakers | 100.0 | 100.2 | 89.3 | 91.1 | 96.1 | 96.1 | 75.1 | 69.8 | 81.0 | 61.8 | 45.8 | 39.4 | 25.9 | 25.4 |
| Carmen, coach and locomotive | 100.0 | 108.1 | 114.7 | 120.8 | 137.5 | 134.7 | 93.5 | 90.8 | 101.2 | 90.7 | 79.0 | 69.1 | 59.3 | 56.9 |
| Carmen, freight | 100.0 | 108.0 | 104.7 | 129.7 | 145.7 | 146.3 | 125.1 | 133.3 | 134.6 | 132.9 | 118.1 | 111.4 | 105.1 | 102.0 |
| Electrical workers | 100.0 | 103.6 | 104.0 | 112.6 | 131.9 | 132.9 | 122.3 | 133.8 | 157.6 | 171.9 | 167.1 | 169.8 | 154.3 | 148.8 |
| Machinists | 100.0 | 98.2 | 93.4 | 101.8 | 109.2 | 109.5 | 89.9 | 87.0 | 97.4 | 87.0 | 74.8 | 68.7 | 60.4 | 58.1 |
| Moulders | 100.0 | 98.4 | 90.5 | 90.5 | 93.7 | 95.2 | 66.7 | 61.9 | 73.0 | 61.9 | 44.4 | 47.6 | 39.7 | 17.5 |
| Pipefitters and sheet-metal workers | 100.0 | 109.1 | 107.2 | 114.6 | 133.6 | 128.3 | 97.6 | 101.0 | 105.8 | 99.0 | 84.4 | 82.9 | 72.8 | 68.3 |
| Total | 100.0 | 104.4 | 101.9 | 114.8 | 128.1 | 127.7 | 103.2 | 104.7 | 112.0 | 105.6 | 92.5 | 86.5 | 77.9 | 75.0 |
| Semi-Skilled | | | | | | | | | | | | | | |
| Stationary engineers, firemen and oilers | 100.0 | 98.0 | 99.7 | 106.0 | 111.3 | 109.9 | 101.0 | 99.3 | 109.6 | 99.3 | 96.4 | 94.7 | 86.1 | 82.1 |
| Helpers to mechanics | 100.0 | 103.0 | 96.8 | 108.7 | 122.1 | 118.9 | 96.0 | 95.8 | 105.2 | 97.7 | 84.6 | 76.8 | 65.0 | 60.4 |
| Apprentices | 100.0 | 101.8 | 94.8 | 99.3 | 112.5 | 113.8 | 101.3 | 88.6 | 85.6 | 78.6 | 71.8 | 67.3 | 59.4 | 52.1 |
| Total | 100.0 | 102.4 | 96.6 | 107.0 | 119.8 | 117.4 | 97.2 | 94.8 | 102.2 | 94.5 | 83.2 | 76.3 | 65.4 | 60.4 |
| Unskilled | | | | | | | | | | | | | | |
| Coach cleaners | 100.0 | 102.2 | 94.2 | 100.0 | 104.1 | 105.5 | 106.3 | 103.9 | 105.4 | 106.6 | 97.8 | 92.5 | 85.0 | 78.2 |
| Classified labourers (shops, enginehouses and power plants) | 100.0 | 99.2 | 95.1 | 108.9 | 117.2 | 121.2 | 117.8 | 115.8 | 115.9 | 111.3 | 89.0 | 77.8 | 68.3 | 61.3 |
| Unclassified labourers (shops, enginehouses and power plants) | 100.0 | 103.3 | 96.6 | 110.4 | 121.8 | 120.5 | 97.3 | 100.4 | 105.5 | 102.9 | 96.6 | 91.2 | 71.1 | 64.4 |
| Total | 100.0 | 101.5 | 95.5 | 107.5 | 116.1 | 117.4 | 107.0 | 107.0 | 109.3 | 106.9 | 94.0 | 86.5 | 73.2 | 66.3 |
| TOTAL Maintenance of Equipment Employment | 100.0 | 103.2 | 99.1 | 110.9 | 122.9 | 122.4 | 103.1 | 103.0 | 108.7 | 103.2 | 90.9 | 84.5 | 74.5 | 70.1 |

TABLE 5

Total and Maintenance of Equipment Employment on CPR

| | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | Change 1948–1961 | Change in Broad Employee Groups as Percentage of the Total Change in Maintenance of Equipment Employment 1948–1961 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General foremen, foremen & assistant foremen | 853 | 890 | 881 | 961 | 1,043 | 1,053 | 998 | 964 | 938 | 949 | 884 | 865 | 841 | 819 | – 34 | 0.6 |
| Skilled | | | | | | | | | | | | | | | | |
| Blacksmiths | 272 | 277 | 259 | 271 | 313 | 321 | 232 | 197 | 192 | 179 | 145 | 129 | 116 | 116 | – 156 | 2.8 |
| Boilermakers | 563 | 564 | 503 | 513 | 541 | 541 | 423 | 393 | 456 | 348 | 258 | 222 | 146 | 143 | – 420 | 7.6 |
| Carmen, coach & locomotive | 1,284 | 1,388 | 1,473 | 1,551 | 1,766 | 1,729 | 1,201 | 1,166 | 1,299 | 1,165 | 1,014 | 887 | 762 | 731 | – 553 | 10.0 |
| Carmen, freight | 2,709 | 2,927 | 2,835 | 3,514 | 3,947 | 3,963 | 3,390 | 3,611 | 3,647 | 3,600 | 3,198 | 3,017 | 2,846 | 2,763 | + 54 | |
| Electrical workers | 420 | 435 | 437 | 473 | 554 | 558 | 514 | 562 | 662 | 722 | 702 | 713 | 648 | 625 | + 205 | |
| Machinists | 2,169 | 2,131 | 2,026 | 2,209 | 2,368 | 2,374 | 1,950 | 1,888 | 2,112 | 1,887 | 1,623 | 1,490 | 1,310 | 1,261 | – 908 | 16.4 |
| Moulders | 63 | 62 | 57 | 57 | 59 | 60 | 42 | 39 | 46 | 39 | 28 | 30 | 25 | 11 | – 52 | 0.9 |
| Pipefitters & sheet-metal workers | 584 | 637 | 626 | 669 | 780 | 749 | 570 | 590 | 618 | 578 | 493 | 484 | 425 | 399 | – 185 | 3.4 |
| Total | 8,064 | 8,421 | 8,216 | 9,257 | 10,328 | 10,295 | 8,322 | 8,446 | 9,032 | 8,518 | 7,461 | 6,972 | 6,278 | 6,049 | – 2,015 | 38.3 |
| Semi-Skilled | | | | | | | | | | | | | | | | |
| Stationary engineers, firemen & oilers | 302 | 296 | 301 | 320 | 336 | 332 | 305 | 300 | 331 | 300 | 291 | 286 | 261 | 248 | – 54 | 1.0 |
| Helpers to mechanics | 3,623 | 3,730 | 3,507 | 3,940 | 4,424 | 4,306 | 3,478 | 3,470 | 3,811 | 3,538 | 3,064 | 2,781 | 2,355 | 2,188 | – 1,435 | 26.0 |
| Apprentices | 800 | 814 | 758 | 794 | 900 | 910 | 810 | 709 | 685 | 629 | 574 | 538 | 475 | 417 | – 383 | 6.9 |
| Total | 4,725 | 4,840 | 4,566 | 5,054 | 5,660 | 5,548 | 4,593 | 4,479 | 4,827 | 4,467 | 3,929 | 3,605 | 3,091 | 2,853 | – 1,872 | 35.6 |
| Unskilled | | | | | | | | | | | | | | | | |
| Coach cleaners | 894 | 914 | 842 | 894 | 931 | 943 | 950 | 929 | 942 | 953 | 874 | 827 | 760 | 699 | – 195 | 3.5 |
| Classified labourers (shop, enginehouse & power plant) | 1,487 | 1,475 | 1,414 | 1,619 | 1,743 | 1,802 | 1,752 | 1,722 | 1,723 | 1,655 | 1,323 | 1,157 | 1,016 | 911 | – 576 | 10.4 |
| Unclassified labourers | 1,600 | 1,653 | 1,546 | 1,766 | 1,949 | 1,928 | 1,557 | 1,607 | 1,688 | 1,646 | 1,546 | 1,459 | 1,137 | 1,031 | – 569 | 10.3 |
| Total | 3,981 | 4,042 | 3,802 | 4,279 | 4,623 | 4,673 | 4,259 | 4,258 | 4,353 | 4,254 | 3,743 | 3,443 | 2,913 | 2,641 | – 1,340 | 25.5 |
| TOTAL – Maintenance of Equipment Employment. | 17,623 | 18,193 | 17,465 | 19,551 | 21,654 | 21,569 | 18,172 | 18,147 | 19,150 | 18,188 | 16,017 | 14,885 | 13,123 | 12,362 | – 5,261 | 100.0 |
| TOTAL – CPR Employment | 82,206 | 83,672 | 81,040 | 86,765 | 90,619 | 90,232 | 81,994 | 81,776 | 84,924 | 83,348 | 76,509 | 73,277 | 67,973 | 63,694 | –18,512 | |

changes on the levels of employment in the sub-groups.3/ Some sub-groups are not only highly affected by cyclical traffic movements but also show considerable decline between 1948 and 1961. The course of employment of coach and locomotive carmen shows these characteristics. The same applies to blacksmiths, pipe fitters and sheet-metal workers, helpers to mechanics, and labourers (classified and unclassified). The significant reductions in these categories between 1948 and 1961 may have resulted from the intensity of the reactions of these groups to declines in traffic volume, but it is certain that technological change has also played a significant role.

On the other hand, the employment history of the machinists as with moulders and boilermakers, shows a low reaction to changes in traffic volume and a significant decline over the period, suggesting strong technological influences on the level of their employment.

At first glance, freight carmen appear to have been a highly resilient group in the face of technological change, their numbers having remained more or less constant throughout the period. Several factors may account for this apparent inconsistency in the general employment trend. A possible over-expansion of freight carmen employment during the heavy freight years of 1952 and 1953 may have been absorbed by the demands of an even heavier freight volume in 1956, with a relatively smaller increase in employment than in other sub-groups. The figures do not distinguish between repair carmen and inspection carmen. Inspection carmen have not been significantly affected by technological change. Perhaps the most important reason is that during the period under review, cars which might have required only relatively light repairs have been rebuilt to incorporate the latest ideas, exerting an upward pressure on the employment of freight carmen. For the future, it may be expected that the decreased maintenance requirements of modernized freight cars, together with improved work methods, may exert a greater downward pressure on the employment of freight carmen.

Long-Term Trends in the Employment Structure at Angus Workshops

Employment at Angus declined from 6,208 in 1948 to 3,482 in 1961, a reduction of 2,426, or 43.9 per cent. In this over-all contraction, the major occupational groups are represented as follows:4/

| | Per Cent of Total Decline |
|---|---|
| Skilled employees..... | 48.4 |
| Semi-skilled employees..... | 33.5 |
| Unskilled employees..... | 16.4 |
| Clerical and supervisory employees... | 1.8 |

Skilled workers declined by 1,319 or 44.8 per cent, this being 48.4 per cent of the total decline. Semi-skilled workers declined by 913 or 52.4 per cent, while constituting 33.5 per cent of the total decline. Employment of unskilled workers fell by 446 or 37.4 per cent, while making up 16.4 per cent of the total reduction.

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3/ See Appendix 7, Part I, for table showing cyclicality of employment for occupational groups at Angus.

4/ Table 6.

TABLE 6

Changes in Employment at Angus Workshop, 1948–1961

| Occupation | Average – 1948 | | | Average – 1961 | | | ▲ 1948–1961 | Percentage ▲ 1948–1961 | Change in Each Occupation as a Percentage of Total Change, in the Skill Group 1948-1961 | Change in Each Occupation as a Percentage of the Total Change in the Skill Group |
|---|---|---|---|---|---|---|---|---|---|---|
| | Loco-motive | Car Dept. | Total | Loco-motive Shop | Car Dept. | Total | | | | |
| Skilled | | | | | | | | | | |
| Changehands | 38 | 18 | 56 | 19 | 20 | 39 | - 17 | - 30.4 | 0.6 | 1.3 |
| Markers-off | 7 | 3 | 10 | 4 | 2 | 6 | - 4 | - 28.5 | 0.1 | 0.3 |
| Machinists – brass | 43 | 26 | 69 | – | 19 | 19 | - 50 | - 72.5 | 1.8 | 3.8 |
| metal | 536 | 151 | 687 | 256 | 153 | 409 | - 278 | - 40.5 | 10.2 | 21.1 |
| wood | – | 70 | 70 | – | 4 | 4 | - 66 | - 94.3 | 2.4 | 5.0 |
| Foregemen | 10 | 3 | 13 | 2 | – | 2 | - 11 | - 84.6 | 0.4 | 0.8 |
| Hammersmiths | 4 | – | 4 | 1 | – | 1 | - 3 | - 75.0 | 0.1 | 0.2 |
| Blacksmiths | 31 | 18 | 49 | 21 | 3 | 24 | - 25 | - 51.0 | 0.9 | 1.9 |
| Boilermakers | 188 | | 188 | 30 | | 30 | - 158 | - 84.0 | 5.8 | 12.0 |
| Flangers | 1 | | 1 | – | | – | - 1 | -100.0 | – | 0.1 |
| Pipe S–fitters | 70 | 84 | 154 | 41 | 55 | 96 | - 58 | - 37.7 | 2.1 | 4.4 |
| Sheet-metal workers | 16 | 149 | 165 | 5 | 81 | 86 | - 79 | - 47.9 | 2.9 | 6.0 |
| Electricians | 42 | 44 | 86 | 81 | 25 | 106 | + 20 | + 23.3 | – | – |
| Moulders | 36 | | 36 | 3 | | 3 | - 33 | - 91.7 | 1.2 | 2.5 |
| Patternmakers | 7 | – | 7 | 4 | – | 4 | - 3 | - 42.9 | 0.1 | 0.2 |
| Frogswitch fitters | 21 | | 21 | 18 | | 18 | - 3 | - 14.3 | 0.1 | 0.2 |
| Carpenters – coach | 14 | 262 | 276 | 22 | 76 | 98 | - 178 | - 64.5 | 6.5 | 13.5 |
| freight | 42 | 445 | 487 | 16 | 383 | 399 | - 88 | - 18.1 | 3.2 | 6.7 |
| Trimmers | – | 41 | 41 | – | 16 | 16 | - 25 | - 61.0 | 0.9 | 1.9 |
| Strippers | 8 | 12 | 20 | – | 2 | 2 | - 18 | - 90.0 | 0.7 | 1.4 |
| Painters | 35 | 188 | 223 | 16 | 90 | 106 | - 117 | - 52.5 | 4.3 | 8.8 |
| Cabinetmakers | | 53 | 53 | | 11 | 11 | - 42 | - 79.2 | 1.5 | 3.2 |
| Oxidizers | | 10 | 10 | | 5 | 5 | - 5 | - 50.0 | 0.2 | 0.4 |
| Brass buffers | | 11 | 11 | | 6 | 6 | - 5 | - 45.5 | 0.2 | 0.4 |
| Varnishers | | – | – | | – | | – | | – | |
| Color mixers | | 1 | 1 | | – | | - 1 | -100.0 | – | 0.1 |
| Stencil cutters | | 1 | 1 | | 2 | 2 | + 1 | +100.0 | – | – |
| Upholsterers | | 58 | 58 | | 31 | 31 | - 27 | - 46.0 | 1.0 | 2.0 |
| Seamstresses | | 11 | 11 | | 4 | 4 | - 7 | - 63.6 | 0.3 | 0.5 |
| Carmen | | 24 | 24 | | 10 | 10 | - 14 | - 58.3 | 0.5 | 1.1 |
| Cranemen | 42 | 10 | 52 | 21 | 10 | 31 | - 21 | - 40.4 | 0.8 | 1.6 |
| Welders | | 60 | 60 | | 57 | 57 | - 3 | - 5.0 | 0.1 | 0.2 |
| Total | 1,191 | 1,753 | 2,944 | 560 | 1,065 | 1,625 | -1,319 | - 44.8 | 48.4 | 101.7 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Semi-Skilled | | | | | | | | | |
| Transfer table operators | | 2 | 2 | | 1 | 1 | - 1 | - 50.0 | – |
| Yardmen | 21 | | 21 | 17 | | 17 | - 4 | - 19.0 | 0.1 |
| Engineers | 7 | | 7 | 7 | | 7 | 0 | 0 | – |
| Firemen | 24 | | 24 | 16 | | 16 | - 8 | - 33.3 | 0.3 |
| Apprentices | 156 | 144 | 300 | 67 | 47 | 114 | - 186 | - 62.0 | 6.8 |
| Helpers | 663 | 726 | 1,389 | 251 | 424 | 675 | - 714 | - 51.4 | 26.2 |
| Total | 871 | 872 | 1,743 | 358 | 472 | 830 | - 913 | - 52.4 | 33.5 |
| Unskilled | | | | | | | | | |
| Boys | 6 | 5 | 11 | 3 | 2 | 5 | - 6 | - 54.5 | 0.2 |
| Labourers | 282 | 494 | 776 | 113 | 372 | 483 | - 291 | - 37.5 | 10.7 |
| Miscellaneous | 174 | 231 | 405 | 113 | 143 | 256 | - 149 | - 36.8 | 5.5 |
| Total | 462 | 730 | 1,192 | 229 | 517 | 746 | - 446 | - 37.4 | 16.4 |
| Clerical & Supervisory | | | | | | | | | |
| General foremen | 4 | 2 | 6 | 2 | 3 | 5 | - 1 | - 16.7 | – |
| Foremen | 16 | 17 | 33 | 17 | 15 | 32 | - 1 | - 3.0 | – |
| Assistant foremen | 36 | 37 | 73 } 125 | 26 | 60 | 86 } 94 | + 13 } -31 | + 17.8 } -24.8 | – |
| Contract foremen | 16 | 36 | 52 } | 3 | 5 | 8 } | - 44 } | - 84.6 } | 1.6 |
| Clerks – whs mgr | 17 | 17 | 34 } 80 | 22 | 23 | 45 } 94 | + 11 | + 32.4 | – |
| shop-yard | 21 | 25 | 46 } | 22 | 27 | 49 } | + 3 | + 6.5 | – |
| Miscellaneous | 77 | 8 | 85 | 51 | 5 | 56 | - 29 | - 34.1 | 1.1 |
| Total | 187 | 142 | 329 | 143 | 138 | 281 | - 48 | - 14.6 | 1.8 |
| TOTAL | 2,711 | 3,497 | 6,208 | 1,290 | 2,192 | 3,482 | -2,726 | - 43.9 | 100.1 |

Among the sub-groups that declined very significantly between 1948 and 1961 and whose reduction constitutes a significant part of the total reduction at the workshops are:

a) Machinists - from 826 to 432 (47.7 per cent);

b) Boilermakers - from 188 to 30 (84.0 per cent);

c) Pipe Steamfitters - from 154 to 96 (37.7 per cent);

d) Sheet-metal workers - from 165 to 86 (47.9 per cent);

e) Carpenters - coach - from 276 to 98 (64.5 per cent);

f) Painters - from 223 to 106 (52.5 per cent);

g) Apprentices - from 300 to 114 (62.0 per cent);

h) Helpers - from 1,389 to 675 (51.4 per cent);

i) Labourers - from 776 to 485 (37.5 per cent);

j) Miscellaneous - from 405 to 256 (36.8 per cent).

Table 6 also demonstrates that, among shop floor employees, the employment trends of electricians are unique. Between 1948 and 1961, their employment level increased from 86 to 106; however, this is the net effect of an increase in the Locomotive Department of 39 and a decrease in the Car Department of 19.

Finally, the effect of employment change among clerical and supervisory grades has been to reduce the rate of decline in total employment. However, the combined classes of assistant foremen and contract foremen show a reduction of 31 between 1948 and 1965. Since this figure (a drop of 24.8 per cent) is significantly less than the reduction of 44.8 per cent in skilled grades, 52.4 per cent in semi-skilled grades and 37.4 per cent in unskilled grades, it can be concluded that the degree of supervision at Angus has become more concentrated over the period.

Table 7

Composition of Employment at Angus, Third Quarter

| Occupation Group | Percentage of Total Employment | | | | | |
|---|---|---|---|---|---|---|
| | 1948 | 1950 | 1952 | 1954 | 1956 | 1961 |
| Skilled..... | 46.2 | 48.2 | 49.1 | 47.2 | 48.0 | 46.3 |
| Semi-skilled..... | 28.3 | 26.8 | 28.0 | 26.5 | 26.2 | 23.4 |
| Unskilled..... | 19.5 | 19.4 | 18.0 | 19.9 | 20.4 | 22.1 |
| Clerical & Supervisory. | 5.8 | 5.6 | 4.9 | 6.5 | 5.4 | 8.2 |
| Total..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Table 7 shows the shifts in the composition of employment at Angus as reflected in broad group movements over the period. Comparison is made of the peaks and troughs in the cyclical employment data of the terminal years (1948 and 1961) and selected intermediate years.

The significant changes are the reduced proportion of total employment now formed by semi-skilled workers and the increased proportion formed by unskilled workers, and clerical and supervisory grades. However, it will be noted that in the case of the latter grades, at least part of their changing importance in total employment is a result of the greater average stability of their employment compared with other grades. Thus, the proportion taken up by clerical and supervisory grades tends to increase as total employment falls and to decrease as total employment rises. Table 8 demonstrates this trend for the four periods indicated.

That this is not a complete explanation of the increasing proportion of total employment taken up by clerical and supervisory personnel, may be seen from the fact that clerical staff at Angus have increased in number from 80 to 94 (or by 17.5 per cent) between 1948 and 1961.5/ It would be extremely difficult to estimate the extent to which this increase may be due to the occurrence of: 1) technological changes in the type of equipment brought to Angus for maintenance; 2) a greater degree of control being exercised by management over the scheduling of locomotives and cars for maintenance work; and 3) a greater demand for clerical labour per unit of non-clerical labour, as the relative prices of clerical and non-clerical labour have altered over the post-war years.

Dealing with the same broad groups, Table 8 illustrates the changes in these groups over selected years between 1948 and 1961. The figures suggest a tendency for semi-skilled work to be the most responsive to traffic (or revenue) variations. In three out of the four selected periods, the responsiveness of semi-skilled workers was greater than that of the other groups.

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5/ The consolidation of these two groups is legitimate because union-management negotiations in 1951 resulted in the advancement of piece-rate payments. The numbers of contract foremen were reduced and the personnel involved were classified as assistant foremen. At the same time, supervisory personnel in general were expanded to provide adequate supervision under time-rate payments.

The 1951 figures for assistant and contract foremen in the Locomotive and Car Departments provide evidence on these points:

| | 1951 Quarters | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Locomotive Department | | | | |
| Assistant foremen..... | 35 | 40 | 48 | 48 |
| Contract foremen..... | 16 | 12 | 4 | 4 |
| Car Department | | | | |
| Assistant foremen..... | 39 | 57 | 92 | 94 |
| Contract foremen..... | 41 | 31 | 9 | 9 |

TABLE 8

Figures of Broad Employee Groups for Third Quarter of Each Year
(CPR Angus Shops)

| Employee Groups | Low 1950 | High 1952 | ▲ 1950-1952 | % Change | % of Total Change | Low 1954 | ▲ 1952-1954 | % Change | % of Total Change | High 1956 | ▲ 1954-1956 | % Change | % of Total Change | Low 1961 | ▲ 1956-1961 | % Change | % of Total Change |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Skilled ..... | 2,953 | 3,974 | 1,021 | 34.5 | 52.1 | 2,449 | 1,525 | 38.4 | 52.6 | 2,965 | 516 | 21.6 | 52.3 | 1,591 | 1,374 | 46.3 | 50.1 |
| Semi-Skilled.. | 1,643 | 2,265 | 622 | 37.9 | 31.8 | 1,374 | 891 | 39.3 | 30.8 | 1,620 | 246 | 17.9 | 25.0 | 802 | 818 | 50.5 | 29.8 |
| Unskilled ... | 1,192 | 1,456 | 264 | 22.1 | 13.5 | 1,034 | 422 | 29.0 | 14.6 | 1,259 | 225 | 21.8 | 22.8 | 760 | 499 | 39.6 | 18.2 |
| Clerical & Supervisory | 344 | 396 | 52 | 15.1 | 2.7 | 337 | 59 | 14.9 | 2.0 | 332 | - 5 | - 1.5 | | 280 | 52 | 15.7 | 1.9 |
| Total ... | 6,132 | 8,091 | *1,959 | *31.9 | | 5,194 | -2,897 | -35.8 | | 6,176 | *987 (excluding negative change) | *19.0 | | 3,433 | -2,743 | -44.4 | |

A primary reason for this is the predominance of the helpers' class in the semi-skilled group. A glance at the detailed breakdown of employment groups at Angus in Table 6 is sufficient to make this point clear. Both in terms of the sensitivity of their employment totals to cyclical forces and of the magnitude of the numbers involved, the helpers' class has played a significant part in the cyclicality and downward trend of total employment at Angus over the period. In fact, 26.2 per cent of the total reduction in Angus employment between 1948 and 1961 may be attributed to helpers alone. This total over the period has fallen from 1,389 to 675, a reduction of 714, or 51.4 per cent.

In terms of broad groups, Tables 25 and 26 indicate that semi-skilled workers have been the group most affected by employment reductions, although skilled workers have also been greatly reduced in numbers. The unskilled component has been more stable and employment has fallen less than in the former groups (Tables 8 and 21).

It should be emphasized, however, that reduction in employment totals and reduction in job totals are not identical in the context of the Angus Workshops. This could only hold true if there were perfect mobility between different employee grades and if work classifications were rigid. Thus, some helpers may have been dismissed and their work taken over by skilled workers who were conceivably redundant in their own field but who--despite the transfer--continued to be shown on the employment records and payroll as skilled workers. This point is discussed further in Chapter 2, Part II.

It should be noted here, however, that the change in the skill content of Angus work may not be adequately measured by the change in the ratio of skilled to semi-skilled workers. A skilled person is one who works under the supervision of a foreman, the helper is a person who helps a tradesman. Thus, the work may have become simplified and reduced in its skill content. But work rules being in force may require that a helper cannot do a job--not because it is too demanding in skill but because, by definition, a helper can only help. Thus skilled workers may now be employed on work which demands less skill than was earlier the case.

The question then arises as to whether the skilled mix of the workers employed at Angus has become more or less skilled over the period. The answer depends on how broadly the different groups are defined. The ratio of skilled to semi-skilled workers indicates that the skill mix has increased. However, when labourers are included their preponderance in the total employment leads one to assume a drop in the skill mix (Tables 6 and 7). If, again, clerical and supervisory are included, this would tend to raise the level of the skill mix.6/

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6/ See Table 6. For supplementary evidence and additional remarks please see Table 25 in Part II and the discussion which follows it.

Ideally, cyclically adjusted data should have been used because the employment of the unskilled group shows greater cyclical instability than the skilled and semi-skilled groups. This means that the level of employment of skilled and semi-skilled workers may be understated in 1961 compared with their trend value.

## Chapter 4

## Types of Technical Change in Maintenance of Equipment Operations

The main types of technical change which have significantly affected maintenance of equipment operations in the post-war years may be classified as follows:

a) new sources of motive power;

b) new rolling stock equipment;

c) new fittings in rolling stock equipment;

d) new materials for maintenance usage;

e) extended mechanization of maintenance of equipment work;

f) new techniques in maintenance work.

It is proposed to examine the three main shops at Angus in the light of the different types of technical changes, internal to the railway system, which have affected each shop since 1948. It is not intended to deal with the changes that have occurred in outside industries, even where their effects on the railway industry are noticeable.

### Technical Changes Which Have Affected All Shops

Among the changes which may be included in the 'all shops' category are the following:

New and more effective maintenance and handling equipment to do jobs which have not changed in character over the period.[1]

a) Generalized use of new and more effective hand and power tools (e.g., spanners, ratchet wrenches, carburoid tools, impact wrenches, acetylene burners), including those produced by specialist companies and replacing tools that were improvised and made at Angus.

b) Expanded use of fork-lift trucks and 'track-mobile' (light road-rail motive power) which has greatly increased labour productivity in packing, storing and carrying of materials. A detailed description of a particular application of new materials handling equipment and organization of work methods is given in Appendix 7, Part I, showing the mechanization of the Angus lumber yard, together with details of the work as previously performed and of the work process after the mechanization was completed.

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[1] Here, no reference is made to equipment which has been installed to deal with new types of rolling stock and motive power. Examples would be the greater precision tools required for diesel engine maintenance (e.g., micrometers and other hand equipment and the much more significant volume of maintenance equipment such as armature winders, test stands, etc., specifically designed for diesel repair and maintenance).

It is also interesting to note the significance of the reduced number of material handlers in the total reduction of Stores staff at Angus. Many reasons account for this besides the introduction of new materials handling equipment but it is certainly one of the important factors explaining the decline in employment of this work group. (See further discussion on page 48 and Table 20.)

c) Introduction of air jacks and hydraulic jacks to facilitate removal of freight and passenger car trucks. This change has greatly simplified the process of truck removal since it provides for simultaneous removal of both trucks; it has also reduced the danger of accidents which was common in this task.

d) Expanded use of electric and air hoists to replace hand chain blocks. The degree to which this process alone contributes to labour efficiency is demonstrated by the fact that the fitting of main drums on a locomotive carriage could be reduced from 2 man-hours to one quarter of a man-hour by means of the new equipment.

e) Replacement of steam cranes by diesel cranes. Assuming a common cost base, the relative efficiency may be seen in the reduced maintenance necessary for diesel cranes. Steam cranes required weekly servicing, lighting of fires, and dumping of ashes. Moreover, steam cranes were manned by a craneman and a fireman, whereas diesel cranes are operated by a craneman alone.

f) Installation of vapour degreasing units for the cleaning of components. These replaced lye vats or hand washing and soaping, and reduced the work of component cleaning to a fraction of the time previously required.

g) Developments in synthetic materials, such as paints, enamels and varnishes. In these cases improvements in length of life, adhesion qualities, resistance to abrasion, speed of dyeing reflected in nitro- and resin-lacquers compared with Japan paints have greatly reduced the servicing time in this sector of maintenance work.

h) Generalized use of new and more effective equipment, for example, the use of paint sprays generally to replace brush painting, and stencilling to replace hand lettering of machinery and rolling stock equipment.

The foregoing is not meant to imply that all the changes at Angus had an equal influence on productivity and hence an equal labour displacing effect.[2] For example, the use of air jacks still requires four men as when jacks were hand operated, but the operation is faster and fewer groups are required to do a given volume of work.

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[2] The labour displacement effect relates to the reduction in labour time required in the performance of any particular task and not to the total effect on labour employment after improvements in productivity have generated employment through an increase in the competitiveness of the enterprise.

New and more effective maintenance techniques to do jobs which have not changed in character over the period.[3] —Here, it is possible to list changes over the period in maintenance techniques which have not resulted directly from the technological changes in equipment requiring maintenance but which have affected all shops to some degree.

a) Changes resulting from the reduction in equipment brought in for repair:

1. consolidation of shops;

2. more intensive use of machinery.
In 1961, the Air Brake Departments of the Locomotive, Passenger and Freight Shops were consolidated for economy reasons into and Air Brake Department in the Locomotive Shop. At the same time, a conveyor belt was installed to cut down the time needed to handle components. The cabinet and lumber mills were also consolidated. In view of the reduction in the quantities of materials being handled, this meant better use of floor space, and especially better use of machines. With the consolidation of the shops, machines were rearranged more on a production line basis, and the longer runs thus made possible increased the effectiveness of machine operations. The same was also true of the Locomotive Millwright Department, where all the plant equipment maintenance has become concentrated.

3. Existence of a large volume of spare and redundant equipment. The significant reduction in use of final equipment in certain railway sectors has accentuated the employment decline among personnel engaged in maintenance in those areas. Two types of shops have been markedly affected: the first encompasses the Passenger Car Shops where all types of cars, except the stainless steel passenger car now being expanded in its use, have been reduced in number since 1948. A build-up of fittings inventories has attended this reduction and made it unnecessary to manufacture new fittings for current maintenance needs; the second is the Frog Shop where circumstances again combine to affect employment. The increasing length of trains and a corresponding reduction in the number of trains have led to a relative reduction in the need for sidings at which trains can pass one another. This in turn, has made many 'frogs' redundant. A causative factor in the reduction of sidings is the ability of farmers today to transport their produce greater distances than formerly. Market places are also becoming concentrated with resultant redundancy of agencies as passenger car services decline, and agencies in older market centres become uneconomic to operate.

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[3] Here again there is no discussion of changes associated with dieselization and with the development of stainless steel passenger cars. For example, changes in welding, pipefitting and sheet-metal work have been very extensive in the post-war years and affect all shops. But their main impact has been in the locomotive or passenger car shop and will be discussed later.

b) Changes resulting from reorganization of work to allow for a greater degree of assembly line production.

The switch in motive power from steam to diesel has greatly expanded the possibility of making locomotive maintenance a continuous process form of production. Standardization of diesel locomotive parts increases and facilitates interchangeability of parts between engines and the stripping and erecting of locomotives is not delayed while a part is being repaired. Thus, the average shop time for diesel locomotives is 5 days compared with 18 days for steam locomotives.

It has been mentioned earlier that whenever possible, management has tended to expand the range and number of jobs which can be performed on a production line basis. Air brakes, lumber planing and cutting operations were mentioned as examples.

The production of railroad crossing signs has also developed along these lines. The use of aluminum extrusion and scotchlite has increased the effectiveness and life span of the signs, and has facilitated a continuous production process.

c) Changes resulting from reorganization of work because of the standardization of parts.

This has been mentioned previously as a factor in the expansion of assembly line production forms in maintenance but, in addition, standardized and detachable fittings now make it possible to provide for maintenance of equipment in many areas without whole equipment units (e.g., diesel locomotives, rail diesel cars, and stainless steel passenger cars) being brought into the shops.

Some components for locomotives and cars can now be removed in line servicing shops and replaced by spares; fittings (e.g., latex foam cushions in passengers cars) can now be changed on the line. As a result, a unit is out of operation for a much shorter time and this is very significant both in terms of equipment usage and effeciency.

## Technical Changes Which Have Significantly Affected Particular Shops

### Locomotive Shop

The extensive conversion from steam to diesel motive power has had a mojor impact on maintenance needs and methods. Diesels were first introduced in the CPR system in 1948 and the process of dieselization was virtually complete by 1961 when the use of steam tractive power had been reduced to 11.3 per cent of the total.

The effects of dieselization on maintenance employment are revealed in the numerical reduction of maintenance employees and in the change in the occupational composition of employment. Here, again, the problem is encountered of the relative influences on employment of declines in the volume of equipment to be maintained, where such declines

are due to reductions in the volume of traffic and to changes in the type of motive power. By using an earlier definition of traffic units[4] it has been shown that between 1948 and 1961, total traffic units fell from 30,508,720 to 28,817,706. Some reduction in motive power would be attributable to this fact. However, the reduction in the number of motive power units requiring maintenance is not solely a result of the reduction in traffic units.

In the submission from the CPR to the Royal Commission on Transportation in Canada, Mr. Emerson, Vice-President, provided an estimate of the relative costs of diesel and steam operation. He set out the savings from diesel compared to steam operation (after deducting additional depreciation) to be $53 million, although the statement makes no allowance for the additional cost of money for 1959.[5] This figure can be considered in relation to the figure of total investment in diesel units and related facilities of $222 million.

Mr. Emerson attributed the major part of these savings to the following factors:

a) reduction in maintenance costs;

b) reduction in fuel costs;

c) reduction in crew costs brought about through the operation of heavier trains;

d) improved availability for service.

The significant feature of the diesel locomotive in relation to maintenance of equipment employment is that it requires less extensive servicing and runs longer distances between servicings. These factors result in a reduction in the number of power units needed to maintain a sustained output, in terms of a given number of traffic units drawn over time, with consequent reduction in maintenance employment. In addition the fact that diesel equipment can be maintained by replacement of component parts affects both the availability of the units for service and the handling requirements at maintenance shops.

The fact that, compared to steam locomotives, fewer diesel locomotives are needed to provide a given volume of tractive operations does not in itself explain the lower level of maintenance employment needed to service these units. It is quite possible to envisage technological changes where maintenance employment increases even though the number of units, expressed in some common element, has decreased; this would be the case if the economies resulting from the changes were positive in ways other than maintenance.

In the case of diesels, however, the level of maintenance employment has been adversely affected both by the reduction in the number of units to be maintained and the way in which that maintenance is performed. Different occupations have been affected differently but there

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4/ See Table 3.

5/ Submission of Canadian Pacific Railway Company to the Royal Commission on Railway Transportation in Canada (Montreal, Quebec, September 15, 1960) p. 5.

Table 9

Canadian Pacific Railway Company Locomotives Inventory

| Year | Steam | Diesel | Electric | Total | Rail Diesel Passenger Cars |
|---|---|---|---|---|---|
| 1948.. | 1,747 | 84 | 7 | 1,838 | - |
| 1949.. | 1,722 | 132 | 10 | 1,864 | - |
| 1950.. | 1,690 | 190 | 10 | 1,890 | - |
| 1951.. | 1,664 | 232 | 10 | 1,906 | - |
| 1952.. | 1,622 | 292 | 10 | 1,924 | - |
| 1953.. | 1,594 | 365 | 10 | 1,969 | 4 |
| 1954.. | 1,522 | 459 | 10 | 1,991 | 7 |
| 1955.. | 1,404 | 556 | 10 | 1,970 | 16 |
| 1956.. | 1,205 | 668 | 10 | 1,883 | 31 |
| 1957.. | 972 | 822 | 10 | 1,804 | 43 |
| 1958.. | 776 | 944 | 10 | 1,730 | 55 |
| 1959.. | 553 | 1,009 | 10 | 1,572 | 54 |
| 1960.. | 364 | 1,054 | 10 | 1,428 | 54 |
| 1961.. | 188 | 1,054 | 10 | 1,252 | 54 |

Table 10

Canadian Pacific Railway Company Tractive Power
(excluding self-propelled passenger rail diesel cars)

| Year | Tractive Power* (Pounds) |
|---|---|
| 1948..... | 73,742,250 |
| 1949..... | 75,177,000 |
| 1950..... | 76,754,000 |
| 1951..... | 77,848,000 |
| 1952..... | 77,357,700 |
| 1953..... | 81,543,000 |
| 1954..... | 81,475,000 |
| 1955..... | 81,499,000 |
| 1956..... | 92,332,115 |
| 1957..... | 91,395,615 |
| 1958..... | 90,798,740 |
| 1959..... | 85,066,765 |
| 1960..... | 80,076,390 |
| 1961..... | 72,787,390 |

* Tractive power is defined as the force exerted by powered equipment, measured at the rim of the driving wheels.

is no doubt that, on any reasonable basis of inter-occupational comparison,[6] the absolute level at Angus (or in the CPR system) of total maintenance employment on diesels is lower than in the case of steam engines. Thus, it might be said that, if the number of diesel and steam units were equal, a lower level of maintenance employment would be sufficient to service the diesel units.

Within Angus itself the main effects of dieselization may be ascribed to the following causes.

Reduction in the number of locomotive units over the period.--It has already been stated that, in itself, reduction in the number of locomotive units (coincidental with the shift from steam to diesel motive power) gives no indication of the way in which employment in maintenance would move. A reduction in the number of units for repair might be accompanied by a switch to a more maintenance-labour-intensive type of unit with a possible increase in net maintenance employment. However, it would still seem to be legitimate to point to the reduction in the number of locomotive units as a possible factor in the reduction of maintenance employment.

Table 9 shows that the number of locomotives in use by CPR dropped by 586, or 31.9 per cent between 1948 and 1961. Comparison between the figures for 1954 and 1961 is even more significant, showing a drop of 37.1 per cent.

Table 10 expresses the number of physical units in terms of tractive power.

It will be noticed that, whereas the peak in terms of physical units occurred in 1954, that for tractive power came in 1956. Nevertheless, comparison of the figures for 1956 and 1961 again demonstrates a reduction over the period.

Increase in mileage and time between main shopping for general repair and overhaul of diesels compared with steam.--Here, it is proposed to outline the general principles governing maintenance requirements of steam and diesels. The significant differences between steam and diesel locomotives lie in the greater mileage of diesels between main shop repairs, and their greater potential for specific repairs to be carried out at minor servicing shops. This greater potential in the range of specific repairs stems from the much wider standardization of diesel locomotive parts, allowing repairs to be done on the line without taking the unit off work for any significant time. The faulty part is removed and replaced with a repaired or new part, and the unit put back into operation much more quickly than was the case with steam locomotives.

The greater mileage of diesels between main shop repairs is demonstrated by the following facts. The accumulated mileage of steam locomotives between shopping averaged 125,000 miles in the case of passenger locomotives, 80,000 miles in the case of freight locomotives, while for switching engines the inter-switching mileage averaged 65,000

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[6] This qualification is needed only to allay the criticism that, if one occupation has increased while all other occupations have decreased in employment volume, comparison of total employment levels over time is invalid.

miles. That this average is quadrupled in some cases for diesels is highly significant and the full extent of this difference is brought out in the shopping instructions regarding units in road freight and passenger service contained in Table 11. The numerals 1, 2 and 3 in the Table refer to the classes into which main shop repairs are divided.

Table 11, which shows the mileage periodicity of freight and passenger scheduled repairs, does illustrate the principle of reduced service requirements of diesels. Taking the MLW or GMD passenger units as an example, it will be noted that 512,000 miles lapse between main shoppings compared to 125,000 miles for steam locomotives. And, taking into account the greater emphasis on freight in total railway traffic, the fact that main shop repairs now take place every 256,000 miles compares very favourably in terms of continuity of service with the average steam inter-shopping mileage of 80,000 miles.

Standardization of parts and consequent acceleration of maintenance work.--In a sense, standardization of parts should not be isolated from the policy, developed under the dieselization program, of purchasing parts. Both policies led to a great reduction in the manufacture of parts at Angus. Yet they merit separate discussion because of differences in their implications for maintenance work.

Table 11

Shopping Classifications and Mileages for Diesel Units in Road Freight and Passenger Service, by Engine Type.

| | MLW | | | GMD | | CLC |
|---|---|---|---|---|---|---|
| | Freight | | Passenger | | | |
| Mileage | 244 Eng. | 251 Eng. | Either Engine | Freight | Passenger | |
| 256,000... | 3 | | | | | |
| 320,000... | | | | | | 3 |
| 384,000... | | 3 | | 3 | | |
| 512,000... | 2 | | 3 | | 3 | |
| 640,000... | | | | | | 2 |
| 768,000... | 3 | 2 | | 2 | | |
| 960,000... | | | | | | 3 |
| 1,024,000... | 2 | | 2 | | 2 | |
| 1,152,000... | | 3 | | 3 | | |
| 1,280,000... | 3 | | | | | 2 |
| 1,536,000... | 1 | 1 | 3 | 1 | 3 | |
| 1,600,000... | | | | | | 1 |
| 2,048,000... | | | 1 | | 1 | |

Source: Canadian Pacific Railway Company, Mechanical Department. Maintenance Regulation--Diesel Locomotive Units. Regulation DL-99-1, January 1960, p. 4.

One of the most significant results of parts standardization has been the reduction in shop time now required for engine maintenance. The maintenance process for steam locomotives took the unit out of operation for an average of 18 working days, since each part removed had to be sent to the appropriate shop which supplied custom-made replacement parts. Diesels, on the other hand, are out of service for an average of only five working days. Reassembly can begin immediately the unit has been stripped, using new, or repaired, standardized replacement parts. Even complete spare engines can be fitted without delay.

It should be pointed out that, without further information regarding the number of workers employed directly and indirectly in the maintenance process, a reduction in the number of days spent in main shop repairs is not an adequate criterion of efficiency. Here again, the multiplicity of labour-saving factors makes it difficult to isolate the impact of any one of them. However, the number and composition of disassembly and erecting gangs gives some evidence that the reduction in the number of days spent in main shop repairs is a cause of redundancy. In 1948, an average of 6 gangs were employed at the disassembly and erecting stages, each gang comprising 30 machinists and helpers plus 20 others such as boilermakers and painters. In 1961, one gang of 30, including all relevant crafts, helpers and apprentices was employed at these stages. This seems to suggest that the rapidity of turn-around is a result of factors other than labour intensiveness of maintenance operations and that these same factors have sharply reduced the labour requirements of the maintenance process.

Purchasing of diesel parts in contrast with the manufacturing of steam parts.--There is much more extensive purchasing of parts for diesel locomotives than there was for steam locomotives. This shift in the source of parts has had important effects on employment at Angus. It

Table 12

Shopping Classifications and Intervals for Standard and Road Switches of 1200 H.P. and Under

| Intervals | | Unit Type | |
|---|---|---|---|
| | MLW | Baldwin | GMD |
| 4 years..... | 3 | 3 | 3 |
| 8 years..... | 2 | 2 | 2 |
| 12 years..... | 3 | 3 | 3 |
| 16 years..... | 2 | 2 | 2 |
| 20 years..... | 1 | 1 | 1 |

Source: op. cit., p. 5.

has meant significant reductions in the number of persons employed to manufacture parts and also in the number of those responsible for the machining and finishing of such parts.7/

The shops that have been significantly affected by the switch to the purchase of parts are the Grey-Iron Foundry and the Blacksmiths' Shop. In the former, the employee complement was reduced from 57 to 14 between 1948 and 1961. Many fittings are no longer produced: for example, locomotive cylinders which weighed up to 5 tons each and of which there were two on each locomotive, also grate bars for locomotives which necessitated the constant employment of 4 moulders. Other fittings still produced are much smaller and lighter for diesel than for steam work (e.g., inspection covers and dust guards).

In the Blacksmiths' Shop, parts such as main rods, side rods, pistons, radius links, guide bars, drawbars and equalizer bars8/ were forged for assembly in the Locomotive Shop. All these parts are now purchased with a consequent downward trend in the numbers of machinists and blacksmiths and their helpers. A significant effect of the transfer to production of diesel parts is the reduction in size and weight of diesel components compared with steam. At present, the heaviest pieces forged are shafts of less than 1,000 lbs., whereas steam components weighing up to 2,000 lbs. were previously quite common.

Changes in the composition of line maintenance employment.--It is difficult to estimate the net effects on employment at Angus of expanded line maintenance work. Breakdowns in diesel locomotives can be corrected by the installation of new parts at the nearest servicing point. The parts which are removed can then be repaired at major shops. To a great extent, this was also true of steam engines, although the degree of skill of employees on the line was generally greater than that required of line repairmen with diesel. Moreover, machinists and operators (drillers, shapers, etc.) had to be available in the line shops. Where steam parts were defective, new parts would be machined or finished in the line maintenance shops, thus obviating the necessity of sending the locomotive to a major repair shop.

Consequently, there has been a change in the composition of line maintenance shop employment comparable with that in the main shop. Boilermakers have been virtually eliminated on line maintenance (though some are still employed for pressure vessel testing and heating apparatus);

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7/ It should also be mentioned that the physical and metallurgical differences between steam and diesel components have significantly affected shops and occupations which were primarily employed on the repair of parts. The switch to diesel affected boilermakers by cutting off the supply of boilers for repair. At the same time, the new stream of repairs to diesel equipment, for example, repair of diesel radiators, steel work (e.g., pilots, steps, diesel engine guards, fan guards) and plate work (e.g., traction motor gear cases) have served to change the boilermaker's work into sheet-metal work. On the same principle, machinists formerly employed in repair of steam engine fittings have been replaced by electricians whose skills are in much greater demand since the advent of widespread diesel electric locomotion.

8/ Equalizer bars are still made at Angus but they are now flame cut out of plate.

machinists' work has dropped not only because of reduction in the number of units to be repaired but also because of changes in the type of repair work required; electricians' work has increased just as it has done in the main shops. This is true even though the actual fitting does not require the same degree of skill as in the case of steam, but the need for testing and locating electrical troubles does require skilled labour.

## Changing Occupational Patterns in the Angus Shops

The following description of changes in the employment structure must be considered in the context of qualifacations already made which detract from the value of individually limited studies. In particular, the main qualification for examining the Locomotive Shop by itself lies in the consolidation programs that have brought together in one shop work which had previously been carried out in several shops. However, it is not proposed to do much more than to point out these occupations in which changes since 1948 seem to suggest a need for explanation. These changes may be seen by referring to the Angus Shops Census Reports (Locomotive Department) in Tables 13 and 14.

The reduction in the number of charge hands from 44 to 12 is highly significant. However, this should not be isolated from the change in the number of assistant foremen. These, too, have fallen in number over the period but there has been a considerable upgrading of supervisory staff.

The elimination of machinists-brass from the list of occupations in the Locomotive Shop is also significant. The Brass Shop itself disappeared when the need for brass bushings (which had to be fitted individually to steam locomotives) had ceased to exist.

The number of machinists-metal in the Wheel and Truck Shop and in the Air Brake Shop has increased. This is due at least partly to the setting up of new sub-shops, thus causing the concentration in designated areas of transferees from other shops.

The level of machinists-metal employment in the Erecting Shop has dropped; the reason being the replacement of the machinists by electricians. The major reduction in the West Machine Shop from 181 machinists in 1948 to 23 in 1961 reflects the impact of the purchasing of parts, especially main and connecting rods, and cam shaft bearings which were formerly manufactured and machined at Angus.

Blacksmiths have maintained their level of employment relatively, despite the reduction in forge work and the number of locomotive units. There has been little reduction in spring work, truck work, operating equipment and truck maintenance equipment work. Angus officials maintain that the reductions in work that have occurred are adequately reflected in the overall reduction in the number of blacksmiths at Angus from 30 in 1948 to 22 in 1961, a drop of 27 per cent.

Boilermakers have obviously been affected by the changes of the post-war years, and show a decline from 188 to 35. Steam pipefitters have been subject to the same influences; the reduction in number of pipes, bending of pipes rather than fabrication (because of the need for smooth channels to prevent condensation), and the development of flanged joints to supersede threaded joints have all had an influence on the total of steam pipefitters employed. However, the fact that diesel piping is smaller and more complicated has offset this to some extent.

| Number of Employees Working (excluding absent) | Erecting Shop | Boiler Shop | Carpt. and Trader Shop | S. fitter and Jacket Shops | Paint Shop | East & West Mach. Shops | Spring and Brake Shop | Brass Shop | Tool Shop | Bolt Shop | Blacksmith Shop | Pattern Shop | Electrical Shop | Yard Gang | Trouble Dept. | Power House | Track Gang | B. & B. Department | Yardmaster's Office | Grey Iron Foundry | Wheel Foundry | Bolt and Nut Shop | Frog Shop | Contract Department | Works Manager | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chargehands | 5 | 8 | 4 | 1 | | 1 | 2 | 2 | 1 | | 1 | 1 | 2 | 1 | 2 | 7 | | 4 | | | 1 | 1 | | | | 44 |
| Marker-off | | 2 | | | | 4 | 1 | | | | | | | | | | | | | | | | 1 | | | 8 |
| Machinists-brass | | | | | | | | 47 | | | | | | | | | | | | | | | | | | 47 |
| Metal | 103 | 4 | 38 | 7 | | 181 | 117 | | 41 | 11 | | | 12 | | | 3 | | | | 1 | 1 | 1 | 20 | | | 540 |
| Wood | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forgemen | | | | | | | | | | | | | | | | | | | | | | 10 | | | | 10 |
| Hammersmiths | | | | | | | | | | | 3 | | | | | | | | | | | | | | | 3 |
| Blacksmiths | 3 | 1 | 1 | | | | | | | | 23 | | | | | | | | | | | | 2 | | | 30 |
| Boilermakers | | 188 | | | | | | | | | | | | | | | | | | | | | | | | 188 |
| Flangers | | 1 | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Pipe S-Fts. | | | | 48 | | | | | | | | | | | 22 | | | | | | | | | | | 70 |
| Steel-Metal Wkrs. | | | | 16 | | | | | | | | | | | | | | | | | | | | | | 16 |
| Electricians | | | | | | | | | | | | | 40 | | | | | | | | 1 | | | | | 41 |
| Moulders | | | | | | | | | | | | | | | | | | | | 16 | 20 | | | | | 36 |
| Pattern Makers | | | | | | | | | | | | 7 | | | | | | | | | | | | | | 7 |
| Frog Switch Fts. | | | | | | | | | | | | | | | | | | | | | | | 24 | | | 24 |
| Carpts.-Coach | | | 13 | | | | | | | | | | | 2 | 1 | | | | | | | | | | | 16 |
| Frt. | | | | | | | | | | | | | | | | | | 41 | | | | | | | | 41 |
| Trimmers | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Strippers | 5 | | | 1 | | | | | | | | | | 2 | | | | | | | | | | | | 8 |
| Painters | | | | | 23 | | | | | | | | | | | | | 9 | | | | | | | | 32 |
| Cranemen | 2 | | | | | | | | | | | | 24 | 7 | | | | | | 5 | 2 | 1 | 1 | | | 42 |
| Yardmen | | | | | | | | | | | | | | | | | | | 21 | | | | | | | 21 |
| Engineers | | | | | | | | | | | | | | | | | | | 7 | | | | | | | 7 |
| Firemen | | | | | | | | | | | | | | | | 17 | | | 7 | | | | | | | 24 |
| Apprentices | 16 | 35 | 6 | 10 | 3 | 21 | 12 | 9 | 6 | 2 | 8 | 2 | 11 | | 2 | | | | | 4 | | 1 | | | | 148 |
| Boys | 4 | | | | | | | | | | | | | | 1 | | | | | | | | | | | 5 |
| Helpers | 60 | 138 | 27 | 52 | 7 | 38 | 42 | 2 | 4 | 5 | 53 | 1 | 60 | 9 | 31 | 1 | | | | 26 | 64 | 17 | 23 | | | 660 |
| Labourers | 37 | 13 | 13 | 6 | | 26 | 14 | 3 | 2 | 2 | 9 | 2 | 40 | 53 | 32 | 11 | | | | 1 | 3 | 4 | 14 | | | 285 |
| Miscellaneous | 19 | 8 | 18 | | | 13 | 6 | | | 1 | 32 | | 10 | 13 | | 28 | 11 | 3 | | 1 | 3 | 2 | 4 | | | 172 |
| General Foremen | 2 | 1 | | | | 1 | | | | | 1 | | | | | | | | | | | | | | | 5 |
| Foremen | 1 | 1 | 1 | 1 | 1 | | 1 | | | | | 1 | 1 | 1 | 1 | | 1 | 1 | | 1 | 1 | | 1 | | | 16 |
| Asst. Foremen | 7 | 3 | 1 | 3 | | 7 | 2 | 2 | 1 | 1 | 2 | | 3 | | 1 | | | | | 1 | 1 | 1 | 2 | | | 38 |
| Cont. Foremen | | | | | | | | | | | | | | | | | | | | | | | | 14 | 3 | 17 |
| Clerks – Works Mgr. | | | | | | | | | | | | | | | | | | | | | | | | | 27 | 27 |
| Shop Yard | 4 | 1 | 1 | | | 1 | 1 | 1 | 1 | | | | 1 | | 1 | | | | 3 | 1 | 1 | 1 | 1 | | | 19 |
| Miscellaneous | 11 | 6 | | | | 6 | | | | | | 1 | 1 | | | 7 | | | 5 | | 1 | | | | 41 | 79 |
| Monthly Total | 25 | 12 | 3 | 4 | 1 | 15 | 4 | 3 | 2 | 1 | 3 | 2 | 6 | 1 | 3 | 7 | 1 | 1 | 8 | 3 | 4 | 2 | 4 | 14 | 71 | 200 |
| Hourly Total | 254 | 398 | 120 | 141 | 33 | 284 | 194 | 63 | 54 | 21 | 129 | 13 | 199 | 87 | 91 | 67 | 11 | 57 | 35 | 54 | 95 | 37 | 89 | | | 2,626 |
| TOTAL | 279 | 410 | 123 | 145 | 34 | 299 | 198 | 66 | 56 | 22 | 132 | 15 | 205 | 88 | 94 | 74 | 12 | 58 | 43 | 57 | 99 | 39 | 93 | 14 | 71 | 2,826 |

LOCOMOTIVE DEPARTMENT TABLE 14 – ANGUS SHOP CENSUS REPORT December 1961

| No. of Employees Working (excluding absent) | Welders Shop | Boiler Shop | Wheel Foundry | Diesel Shop | S. Fitter & Jacket Shop | Paint Shop | East & West Machine Shop | Spring and Brake Shop | Air Brake Shop | Tool Shop | Bolt Shop | Blacksmith Shop | Pattern Shop | Electrical Shop | Garage | Ox. & Acty Equipmt. Repr. | Labourers | Trouble Department | Power House | Track Gang | B & B Department | Yardmaster's Office | Grey Iron Foundry | Bolt & Nut Shop | Frog Shop | Prod. Planning & Estg. | Works Manager | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chargehands | | | | | | | | 2 | | 1 | | 1 | | | 1 | | | 3 | | | 3 | | | 1 | | | | 12 |
| Markers-off | | 1 | 1 | | | | | 1 | | | | | | | | | | | | | | | | | 1 | | | 4 |
| Machinists-Brass | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metal | 2 | | 39 | 52 | | | 23 | 56 | 41 | 16 | 8 | 2 | | 1 | 7 | 3 | | | 2 | | | | | | 13 | | | 265 |
| Wood | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forgemen | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | 2 |
| Hammersmiths | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | 1 |
| Blacksmiths | | | | | | | | | | | | 22 | | | | | | | | | | | | | | | | 22 |
| Boilermakers | | 35 | | | | | | | | | | | | | | | | | | | | | | | | | | 35 |
| Flangers | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pipe S-Fitters | | | | | 17 | | | | | | | | | | | | | 22 | | | | | | | | | | 39 |
| Steel-Metal Wkrs. | | | | | 7 | | | | | | | | | | | | | | | | | | | | | | | 7 |
| Electricians | | | | 59 | | | | | | | | | | 24 | 2 | | | | | | | | | | | | | 85 |
| Moulders | | | | | | | | | | | | | | | | | | | | | | 3 | | | | | | 3 |
| Pattern Makers | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frog Switch Fts. | | | | | | | | | | | | | | | | | | | | | | | | | 18 | | | 18 |
| Carpts. – Coach | | | 2 | | | | | | | | | | | | | | | 1 | | | 23 | | | | | | | 26 |
| Frt. | | | | | | | | | | | | | | | | | | | | | 17 | | | | | | | 17 |
| Trimers | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Strippers | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Painters | | | | | | 14 | | | | | | | | | | | | | | | 3 | | | | | | | 17 |
| Cranemen | | | | 2 | | | | 1 | | | | | | 13 | | | | | | | | | 1 | 1 | 1 | | | 19 |
| Yardmen | | | | | | | | | | | | | | | | | | | | | | 17 | | | | | | 17 |
| Engineers | | | | | | | | | | | | | | | | | | | | | | 7 | | | | | | 7 |
| Firemen | | | | | | | | | | | | | | | | | | | 25 | | | | | | | | | 25 |
| Apprentices | 2 | | | 33 | 5 | | 3 | 4 | 5 | 2 | | 2 | | 9 | | | | 3 | | | | | | | | | | 68 |
| Boys | 1 | | | | | | 1 | | | | | | | 1 | | | | | | | | | | | | | | 3 |
| Helpers | | 6 | 14 | 38 | 12 | 4 | 4 | 27 | 4 | 1 | 2 | 47 | | 16 | 37 | | | 35 | | | | | 5 | 7 | 13 | | | 272 |
| Labourers | | | | | | | | 1 | | | | 7 | | | 4 | | 51 | 18 | 6 | 16 | | | 1 | 2 | 6 | | | 112 |
| Miscellaneous | 10 | 8 | 3 | 16 | | | 2 | 3 | | | | 20 | | 18 | | | | | 27 | | 3 | | 2 | | 1 | | | 113 |
| General Foremen | 1 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | 2 |
| Foremen | | 1 | 1 | 3 | | 1 | | 1 | 2 | 1 | | 1 | | 1 | | | | 1 | | | 1 | | 1 | | 1 | | | 16 |
| Asst. Foremen | 1 | 1 | 1 | 6 | 1 | | 2 | 2 | | | | 2 | | 3 | 1 | | 1 | 1 | | 1 | | | | 1 | 2 | | | 26 |
| Cont. Foremen | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | 3 |
| Clerks-Works Mgr. | | | | | | | | | | | | | | | | | | | | | | | | | | | 22 | 22 |
| Shop Yard | 1 | 1 | | 4 | 1 | | 1 | | 1 | 1 | | 1 | | 1 | 1 | | | 1 | | | | 5 | 1 | 1 | 1 | | | 22 |
| Miscellaneous | 2 | | | | | | | | | | | | | | | | | | 8 | | | 3 | | | | | 34 | 50 |
| Monthly Total | 5 | 3 | 2 | 13 | 2 | 1 | 4 | 3 | 3 | 2 | | 4 | | 5 | 2 | | 1 | 3 | 8 | 1 | 1 | 8 | 2 | 2 | 4 | 3 | 59 | 141 |
| Hourly Total | 15 | 50 | 59 | 200 | 41 | 18 | 33 | 95 | 50 | 20 | 10 | 102 | | 82 | 51 | 3 | 51 | 82 | 60 | 16 | 49 | 24 | 12 | 13 | 53 | | | 1189 |
| TOTAL | 20 | 53 | 61 | 213 | 43 | 19 | 37 | 98 | 53 | 22 | 10 | 106 | | 87 | 53 | 3 | 52 | 85 | 68 | 17 | 50 | 32 | 14 | 15 | 57 | 3 | 59 | 1330 |

Electricians also pointedly reflect the changes brought about by dieselization. In 1948, 40 electricians were employed in the Electrical Shop of the Locomotive Department, assisted by 24 cranemen, 60 helpers, 40 labourers and 11 apprentices (Table 13). They worked mainly on plant maintenance, the repair of electrical equipment and the rewinding of armatures for generators used in the plant. In 1961, this work was done by 24 electricians, assisted by 13 cranemen, 16 helpers and 9 apprentices (Table 14). In addition, there has been a notable development resulting wholly from dieselization in the employment of electricians in the Diesel Shop. In this shop, the diesel units are overhauled, armatures rewound, traction motors repaired, and components such as fuel pumps, crank case exhausters, amplidyne exciters, and auxiliary generators are repaired. In 1961, this shop, together with the Rail Diesel Car Repair Shop (or self-propelled passenger cars), employed 59 electricians, (0 in 1948), 52 metal machinists (103 in 1948 in the Erecting Shop, working only on steam), 33 apprentices (16 in 1948), and 38 helpers (60 in 1948).

Emphasis on the purchase of parts with a consequent discontinuation of the need for castings, has resulted in a considerable reduction in the number of moulders employed at the Grey-Iron Foundry. In addition the discontinuation of production of cast-iron wheels for freight equipment resulted in the closing of the Wheel Foundry. Both of the determinants are illustrated in Table 21 which shows factors relevant to the decline in maintenance employment. Comparison of the figures in Tables 13 and 14 shows that the employment level in the Grey-Iron Foundry dropped from 57 in 1948 to 14 in 1961, a decline of 43. In 1948, 99 men were employed in the Wheel Foundry which as previously mentioned ceased operations in 1961. Of this total reduction of 142 jobs, moulders accounted for 33 (23.4 per cent) and moulders' helpers for 85 (60.3 per cent).

It may also be worth noting the way in which helpers and labourers have fared since 1948. In 1948, the Locomotive Department employed 660 helpers in a total employment of 2,727 (24.2 per cent); in 1961 it employed 272 helpers in a total employment of 1,384 (19.4 per cent). Moreover, of the total reduction of 1,343 in the Locomotive Department, 388 (or 28.9 per cent) were helpers. Labourers meanwhile formed 10.5 per cent of the Department's labour force in 1948 and 8.1 per cent in 1961. Together labourers and helpers formed 34.7 per cent of total employment in 1948 and 27.5 per cent in 1961; and their combined reduction of 561 was 41.8 per cent of the total reduction in the Department's staff.

Passenger Car Shop

The major changes, internal to the railroads, which have affected employment in the Passenger Car Shop.--There have been innumerable technical changes in passenger-car repair work in the post-war years, all of which have had some effect on the level and occupational composition of employment in Angus Passenger Car Shop. Two of these have been especially important.

The first, which is not directly technical, is the marked reduction in the CPR passenger-train car inventory. Indirectly, this reduction may be partly due to changing technology which enables fewer passenger cars to provide a given volume of passenger services, or partly to organizational changes which serve to provide more continuous and intensive service from each passenger car. Far more significant is the reduction due to a decline in the volume of passenger services demanded by the public. This brought about the drop in gross capital expenditure

on passenger cars by CPR which is tabulated in Appendix 1 Part I: $2,636,308 in 1947; $3,606,570 in 1948; $9,391,705 in 1949; $205,451 in 1959; $44,512 in 1960; $19,911 in 1962.2/ Appendix 2, Part I, which lists "Rolling Stock Inventory" provides similar evidence of this decline.

The second reason has been the advent of the stainless steel passenger car. In 1954, when these cars were first introduced into CPR rolling stock, they formed 3.3 per cent of all passanger cars. By 1961 this percentage had increased to 14.2.

An important employment effect of the reduction in the CPR passenger-train car inventory is the accumulation of redundant component parts which it provides. Generators, batteries, electrical fittings and upholstery are available, so that the necessary repair of damaged components is cut down. In addition, the existence of these parts allows for a considerable amount of on-the-line maintenance, thus making it unnecessary to bring the car units into the major repair shops. Furthermore, as the number of cars in service falls, the number of cars brought in for major shop repairs also declines.

Another factor which has contributed in an important way, although to a lesser degree than the absolute reduction in passenger car inventory, is the change in the organization of car maintenance over the years. In 1948, the organization of passenger car maintenance required that, regardless of mileage, cars should be brought in every two years for inspection. At such times, very extensive repair work was done on the cars, all removable parts (e.g., windows, doors, plumbing fixtures, electrical fixtures, and numerous underframe components) being dismantled. All the parts were removed arbitrarily, regardless of condition, and complete interior and exterior renovation and painting was carried out.

In 1955, however, the criterion for scheduled repairs was changed from one of time to one of mileage. Cars brought in at mileages of over 240,000 since the previous repair were scheduled for general repair. Removable parts were inspected to decide whether they should be removed for repair. Interior renovation also was done only if inspection revealed that it was necessary. Under the new system no change was made in the inspection and repair of moving gear. As previously mentioned, all trucks draft gear and running equipment continued to be removed and checked in view of their importance as safety factors. Cars brought in with mileages of less than 240,000 since the last general overhaul received only light repairs and only the obviously defective parts of the car were repaired.

The changeover from a time to a mileage criterion has meant that many cars may now be out for 4 years between main shoppings. Even then, they may not have accumulated 240,000 miles and may be brought in for repair only because of the perishing of exterior paint.

It should be noted, however, that the mileage criterion is still a flexible one. The condition of the car may warrant a general repair even though the mileage is less than 240,000; for example, if the car has had rough service or been misused. Also, in certain instances, where the car is obviously in good condition, it may receive only light repair even with a mileage in excess of 240,000.

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2/ The main reason for the high expenditure figures in 1954 and 1955 is related to the purchase of the self-propelled passenger cars which are listed in Appendix 2, Part I.

The general lengthening of the periods between main shop repairs--because of the change in the basic criterion--reduces the amount of car handling at the main shops. This has also resulted in a greater emphasis on minor repairs and parts replacements at line maintenance points with a consequent reduction in employment at the main shops.10/

Probably the major explanatory factor in the decline of Passenger Car Shop employment is the reduction in passenger car utilization. The advent of the stainless steel passenger car and the rail diesel car are also of prime importance in their influence on occupational composition.

It may be useful to summarize at this point the repair process in relation to wooden passenger cars. Wooden cars were sent in for repairs every two years. The trucks were removed, overhauled and repaired. The roof which was of wood and canvas was repaired or, if necessary, replaced. Some cars had steel roofs but these were usually rusted and had to be replaced. Body repairs were also carried out, wooden cars were washed for exterior painting; all scratched parts were scraped and sanded; woodwork had to be renewed where damaged; floors had to be repaired, headlinings changed or repaired; and upholstering had to be repaired, dyed, and cleaned or replaced. Electrical fittings, although they were not numerous on the earlier wooden type cars, had to be maintained; generators had to be repaired, batteries recharged, and electrical wiring refitted.

The advent of the stainless steel passenger car in 1954 and in the same year the self-propelled rail diesel passenger car, brought about a great change in the maintenance operations on passenger cars. The replacement of steel sheetrod car sides by stainless steel has greatly reduced the frequency of damage. The natural wood finish interior of passenger cars has been replaced by metal and plastic finishes which are much more resistant to damage and can be renovated far more easily than natural wood which must be scraped, stained, varnished (3 or 4 coats) and rubbed. The elaborate cabinet work, characteristic of the earlier passenger cars (e.g., highly finished chairs, doors, sashes), has been eliminated and only partially made up for by the plain writing desks and picture frames which are used to furnish modern cars.

Repairs to modern passenger cars can now be done on the line and the frequency of returns to the shop for incidental repairs is reduced far below that of the old-type cars. The greater use of replaceable parts in modern passenger cars accentuates this potential in line repairs. Generators can be dismantled and sent for repair while the unit itself is returned to service immediately through the use of spares. Similarly, the development of latex foam cushions has facilitated line repair work of upholstery, since cushions are easily fitted and cloth prepared at Angus can be dispatched to line repair points.

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10/ The quantitative significance of this factor is almost impossible to establish, and a comparison of differential reductions in line maintenance points and major shops would be meaningless--if only because the quantitative significance is small in relation to the other factors bearing upon employment levels.

In addition to the foregoing, the amount of work that has to be done on steel cars in the actual process of general repair is much less than was the case with the earlier cars. The need for painting is much less since stainless steel cars have virtually no exterior paint work and the replacement of wood by formica has also made extensive interior painting unnecessary.

The one occupational area where work has expanded is once again the electrical. On modern cars, electrical work is much more extensive than was the case in the earlier cars. Air conditioning is mechanical, while electrical water coolers, razor outlets and public address systems have all served to increase the electrical work in modern cars. There has, therefore, been a rapid and significant growth in the size and power of generators.

The rail diesel car embodies the same type of changes as does the stainless steel passenger car. Here, of course, there is the additional work involved for electricians in the wiring, fitting and repair of the diesel engines with which the self-propelled cars are fitted.

Changes in the level and occupational composition of employment in the Passenger Car Shop.--Since separate records are not kept on employment in the Passenger and Freight Car Shops, discussion of the general changes in the Car Department will be delayed until the technical changes in the Freight Car Shop are discussed. However, the Angus Shops Census Reports (Car Department) which can be seen in Tables 15 and 16, give some comparative details that should be isolated at this stage.

In comparing data in the Angus Workshops Census Report for the months of December 1948 and 1961, some significant changes in the occupational composition are obvious. Painters employed in all shops combined decreased in number from 140 to 35, an indication of the effect on employment in this craft of fewer car shoppings, fewer cars, improved paints and reduced paintwork per car. Similarly, coach carpenters, formerly employed in Shops Nos. 1, 3 and 4 in numbers of 31, 73 and 123 respectively, are now employed in shop No. 4 only, where their total number is 47. Upholsterers have been reduced in number from 67 to 35.

One further interesting feature in the Car Department is the decline in the number of electricians, from a figure of 50 employed in the Car Electric Shop in 1948 to 25 in 1961, despite the growth in volume of electrical work per car. This indicates that the re-organization of maintenance schedules, the reduction in the frequency of major shop repairs and the number of cars has more than outweighed the increase in electrical work to be performed at each shopping. Furthermore new kinds of material handling equipment, especially forklift trucks, have been installed to offset the growth in size and weight of the electrical machinery.

Freight Car Shop

Changes internal to the railroads which have affected the level and occupational composition of employment in Angus Freight Car Shop.--In contrast to almost all other sectors of railway operations, the volume of freight carried has not fallen over the post-war years.

In 1948, 59,080 revenue ton-miles were carried compared with 65,445 million in 1961. To carry this volume, the CPR increased its inventory on all freight-train cars, except conductor vans, box autos and

CAR DEPARTMENT — TABLE 15 – ANGUS SHOPS CENSUS REPORT — DECEMBER 1948

| No. of Employees Working | Shop #1 | Shop #2 | Shop #3 | Shop #4 | Steamfitters Shop | Brass Shop | Cabinet Shop | Upholsterer's Shop | Car Electric Shop | Painters (All Shops) | Truck Shop | Platform Department | Labourers | Blacksmiths' Shop | Planning Mill | Reclaim Dock | Shot Blast | Car Iron Machine Shop | Tinsmith Shop | Wood Freight Shop | Steel Car Shop | Repair Track | Contract Department | Works Manager | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Hands | | | | | 1 | | | 1 | | 2 | 1 | | 1 | 1 | | 1 | | | 2 | 5 | 2 | 1 | | | 18 |
| Markers Off | | | | | | | | | | | 1 | | | | | | | | | | 2 | | | | 3 |
| Machinists–Brass | | | | | | 26 | | | | | | | | | | | | | | | | | | | 26 |
| Metal | | | | | 1 | | | 2 | 9 | | 7 | | | | | | | 139 | 7 | 2 | | 1 | | | 168 |
| Wood | 1 | | 1 | 1 | | | 2 | | | | | | | | 65 | | | | | | | | | | 70 |
| Forgemen | | | | | | | | | | | | | | 2 | | | | | | | | | | | 2 |
| Hammersmiths | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blacksmiths | | | | | | | | | | | | | | 14 | | 5 | | | | | | | | | 19 |
| Pipe S/Fitters | | | | | 57 | | | | | | | | | | | 1 | | | | 13 | 6 | 8 | | | 85 |
| Sheet Metal Wks. | | | | | | | | | | | | | | | | | | | 156 | 10 | 1 | 2 | | | 169 |
| Electricians | | | | | | | | | 50 | | | | | | | | | | | | | | | | 50 |
| Pattern Makers | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cabinet Makers | | | | | | | 59 | | | | | | | | | | | | | | | | | | 59 |
| Carpenters – Coach | 31 | | 73 | 123 | 29 | | | | 9 | | | 10 | 4 | | 12 | | | | 4 | | | | | | 295 |
| Frt. | | | | | | | | | | | | | | | 6 | | | | | 182 | 122 | 123 | | | 433 |
| Trimmers | 16 | | | 31 | | | | | | | | | | | | | | | | | | | | | 47 |
| Strippers | 1 | | 10 | 1 | | | | | | | | | | | | | | | | | | | | | 12 |
| Oxidizers | | | | | | 11 | | | | | | | | | | | | | | | | | | | 11 |
| Brass Buffers | | | | | | 12 | | | | | | | | | | | | | | | | | | | 12 |
| Painters | | | | | | | | | | 140 | | | | | 1 | | | 2 | | 44 | | 4 | | | 191 |
| Varnishers | | | | | | | | | | | | | | | | | | | | | | | | | |
| Color Mixers | | | | | | | | | | 1 | | | | | | | | | | | | | | | 1 |
| Stencil Cutters | | | | | | | | | | 1 | | | | | | | | | | | | | | | 1 |
| Upholsterers | | | | | | | | 67 | | | | | | | | | | | | | | | | | 67 |
| Seamstresses | | | | | | | | 10 | | | | | | | | | | | | | | | | | 10 |
| Carmen | | | | | 1 | | | | | | 2 | | | | | | | | | | 12 | | | | 15 |
| Cranemen | | | | | | | | | | | | | | | | 2 | | | | 1 | 7 | | | | 10 |
| Trans. Table Optrs. | | | | | | | | | | | | | 2 | | | | | | | | | | | | 2 |
| Welders | | | | | | | | | | | 18 | 2 | | 3 | | 4 | | 2 | 1 | 16 | 20 | 2 | | | 68 |
| Apprentices | 2 | | 8 | 19 | 10 | 6 | 1 | 9 | 10 | 10 | | | | 5 | 12 | | | 19 | 18 | 20 | | | | | 149 |
| Boys | | | 1 | 1 | | | | 1 | 1 | | | | | | | | | | 1 | | | | | | 5 |
| Helpers | 4 | | 8 | 8 | 57 | 3 | 7 | 23 | 51 | 35 | 21 | 19 | 9 | 41 | 59 | 26 | 7 | 76 | 24 | 108 | 129 | 54 | | | 769 |
| Labourers | 4 | | 4 | 9 | 7 | | 2 | 4 | 5 | 17 | 9 | 4 | 28 | 10 | 73 | 87 | 1 | 32 | 14 | 93 | 68 | 49 | | | 520 |
| Miscellaneous | | | | 4 | 2 | 1 | | 1 | 2 | 25 | 30 | 7 | 1 | 9 | | 18 | | 21 | 5 | 31 | 51 | 34 | | | 242 |
| Gen'l. Foremen | | | | 1 | | | | | | | | | | | | | | | | 1 | | | | | 2 |
| Foremen | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | | | 16 |
| Asst. Foremen | | | 1 | 2 | 2 | | | 1 | 3 | 4 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 3 | 2 | 5 | 3 | 2 | | | 36 |
| Cont. Foremen | | | | | | | | | | | | | | | | | | | | | | | 33 | 3 | 36 |
| Clerks–Wkrs. Mgr. | | | | | | | | | | | | | | | | | | | | | | | | 26 | 26 |
| Shop Yd. | | | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 | 1 | 1 | | 1 | 2 | 3 | 1 | 1 | | | 23 |
| Miscellaneous | | | | 4 | | | | | 1 | | | | | | | | | | | 4 | | 1 | | | 10 |
| Monthly Total | 1 | | 3 | 12 | 4 | 2 | 2 | 3 | 6 | 6 | 2 | 1 | 1 | 2 | 4 | 3 | 1 | 5 | 5 | 14 | 5 | 5 | 33 | 29 | 149 |
| Hourly Total | 59 | | 105 | 197 | 165 | 59 | 71 | 118 | 137 | 231 | 89 | 42 | 45 | 85 | 228 | 144 | 8 | 291 | 232 | 525 | 420 | 278 | | | 3429 |
| TOTAL | 60 | | 108 | 209 | 169 | 61 | 73 | 121 | 143 | 237 | 91 | 43 | 46 | 87 | 232 | 147 | 9 | 296 | 237 | 539 | 425 | 283 | 33 | 29 | 3678 |

CAR DEPARTMENT — TABLE 16 – ANGUS SHOPS CENSUS REPORT — DECEMBER 1961

| No. of Employees Working | Shop #1 | Shop #2 | Shop #3 | Shop #4 | Steamfitters' Shop | Brass Shop | Cabinet Shop | Upholsterer's Shop | Car Electric Shop | Painters (All Shops) | Truck Shop | Platform Department | Labourers | Planning Mill | Reclaim Dock | Shot Blast | Car Iron Machine Shop | Sheet Metal Shop | Wood Freight Shop | Steel Car Shop | Repair Track | Prod. Planning & Est'g. | Works Manager | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Hands | | | | | | 1 | | 1 | 3 | 2 | 2 | | 1 | | | 1 | | 4 | 1 | 3 | | | | 19 |
| Markers Off | | | | | | | | | | | 1 | | | | | | | | | 1 | | | | 2 |
| Machinists-Brass | | | | | | 19 | | | | | | | | | | | | | | | | | | 19 |
| Metal | | | | | 2 | | | | 9 | | 8 | | | | 2 | | 100 | 4 | | 1 | | | | 126 |
| Wood | | | | 1 | | | | | | | | | | 38 | | | | | 1 | | 1 | | | 41 |
| Forgemen | | | | | | | | | | | | | | | | | | | | | | | | |
| Hammersmiths | | | | | | | | | | | | | | | | | | | | | | | | |
| Blacksmiths | | | | | | | | | | | | | | | 3 | | | | | | | | | 3 |
| Pipe S/Fitters | | | | | 24 | | | | 1 | | | | | | | | | | 20 | 6 | 7 | | | 58 |
| Sheet Metal Wks. | | | | | | | | | | | | | | | | | | 92 | 7 | | 1 | | | 100 |
| Electricians | | | | | | | | | 25 | | | | | | | | | | | | | | | 25 |
| Pattern Makers | | | | | | | 4 | | | | | | | | | | | | | | | | | 4 |
| Cabinet Makers | | | | | | | 11 | | | | | | | | | | | | | | | | | 11 |
| Carpenter–Coach | | | | 47 | 7 | | | | 5 | | | 12 | 2 | 5 | | | | 1 | | | | | | 79 |
| Carpenter–Frt. | | | | | | | | | | | | | | 4 | | | | | | | | | | 4 |
| Trimmers | | | | 17 | | | | | | | | | | | | | | | | | | | | 17 |
| Strippers | | | | 3 | | | | | | | | | | | | | | | | | | | | 3 |
| Oxidizers | | | | | | 5 | | | | | | | | | | | | | | | | | | 5 |
| Brass Buffers | | | | | | 6 | | | | | | | | | | | | | | | | | | 6 |
| Painters | | | | | | | | | | 35 | | | | 2 | | 4 | 2 | 1 | 38 | 5 | 11 | | | 98 |
| Varnishers | | | | | | | | | | | | | | | | | | | | | | | | |
| Color Mixers | | | | | | | | | | | | | | | | | | | | | | | | |
| Stencil Cutters | | | | | | | | | | 2 | | | | | | | | | | | | | | 2 |
| Upholsterers | | | | | | | | 35 | | | | | | | | | | | | | | | | 35 |
| Seamstresses | | | | | | | | 5 | | | | | | | | | | | | | | | | 5 |
| Carmen | | | | 7 | | | | | | | | | | | | | | | 203 | 141 | 151 | | | 502 |
| Cranemen | | | | | | | | | | | | | | | 4 | | | | | 6 | | | | 10 |
| Trans. Table Optrs. | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 |
| Welders | | | | 2 | | | | | | | 6 | 3 | | | 4 | | 2 | 14 | 14 | 16 | 3 | | | 64 |
| Apprentices | | | | 2 | 2 | 1 | | 1 | 8 | 1 | 1 | | | 2 | | | 4 | 12 | 7 | 1 | 1 | | | 43 |
| Boys | | | | | | | | | 1 | | | | | | | | | 1 | | | | | | 2 |
| Helpers | | | | 5 | 20 | 1 | 2 | 8 | 24 | 10 | 10 | 9 | 5 | 35 | 13 | 6 | 77 | 16 | 107 | 74 | 35 | | | 457 |
| Labourers | | | | 4 | 3 | 3 | 1 | 4 | 4 | 4 | 6 | 1 | 18 | 27 | 69 | 2 | 44 | 24 | 63 | 24 | 35 | | | 336 |
| Miscellaneous | | | | 3 | | | | 1 | | 14 | 25 | 2 | | 1 | 34 | | | | 29 | 2 | 14 | | | 125 |
| Gen'l Foremen | 1 | | | | | | | | | | | | | | | | | | 2 | | | | | 3 |
| Foremen | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 | 1 | | 1 | 1 | 1 | 2 | 1 | | | 16 |
| Asst. Foremen | | | 1 | 2 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | | 3 | 2 | | 6 | 7 | 11 | 10 | 7 | | | 61 |
| Cont. Foremen | | | | | | | | | | | | | | | | | | | | | | 5 | | 5 |
| Clerks–Wks. Mgr. | | | | | | | | | | | | | | | | | | | | | | | 23 | 23 |
| Shop–Yd. | 5 | | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | | 1 | 1 | | 1 | 2 | 6 | 1 | 2 | | | 27 |
| Miscellaneous | | | | 1 | | | | | 1 | | | | | | | | | | 2 | | | | | 4 |
| Monthly Total | 6 | | 2 | 5 | 3 | 3 | 2 | 3 | 6 | 5 | 3 | 1 | | 5 | 4 | | 8 | 10 | 22 | 13 | 10 | 5 | 23 | 139 |
| Hourly Total | | | | 91 | 58 | 36 | 18 | 55 | 80 | 68 | 59 | 27 | 27 | 114 | 129 | 13 | 229 | 169 | 490 | 280 | 259 | | | 2202 |
| TOTAL | 6 | | 2 | 96 | 61 | 39 | 20 | 58 | 86 | 73 | 62 | 28 | 27 | 119 | 133 | 13 | 237 | 179 | 512 | 293 | 269 | 5 | 23 | 2341 |

stock cars. The inventories on all other freight-train cars increase are shown in Appendix 2, Part I.

Despite this increase, it might still be expected that the extensive technological changes in freight car structure and repair operations would have reduced the freight car repair employment level since 1948. This has not happened, and over the CPR system the index of freight carmen (which includes carpenters, painters, and other skills associated with freight car repair) has risen to 102.0 in 1961 from the 1948 base of 100[11].

However, certain technical changes have occurred which lead one to believe that there has been at least some downward pressure in freight-car maintenance employment since 1948. The most important of these are:

a) Change from cast-iron wheels to steel wheels on freight cars. In 1949, the percentage of cast-iron wheels to the total number of wheels in service on freight equipment stood at 96.86; by 1961 this figure had fallen to 24.91. The impact of this change on maintenance employment is difficult to quantify. However, a significant cause can be traced to explain why maintenance requirements are reduced. Steel wheels have a much longer life than cast-iron wheels, 10-15 years compared with 5-6 years. The fact that steel wheels fail less often reduces the maintenance work associated with wheel changing; steel wheels are not so prone to fracture and this lessens the need to change wheels. Since previously trucks had to be removed from cars and opened, the reduction in wheel failure reduces the amount of equipment handling. A further change brought about by the shift from cast-iron to wrought steel wheels has been the closing down of the Wheel Foundry at Angus. Table 17 lists the production figures for cast-iron wheels in the Wheel Foundry.

   The effect of the closing of the Wheel Foundry in terms of employment opportunities may be estimated by the number of employees working there in December 1948 (Table 18), bearing in mind that in December 1961 no personnel were employed there.

   This does not mean to say that these 99 employees were dismissed on account of the closure of the foundry; but, at any rate, the jobs disappeared. Again, it must not be inferred that these jobs disappeared from the economy; the transfer of demand to other companies engaged in the production of wrought steel wheels clearly increases the demand in that sector. Thus, the shift to wrought steel

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[11] It may be accepted as a working generalization that employment changes at Angus and the CPR system have been highly correlation over the period covered by this study. Coefficients of correlation for skilled, semi-skilled and unskilled workers between Angus Workshops and the CPR maintenance of equipment staff are +0.966, +0.897 and +0.98 respectively. These high correlation figures are accepted as justifying particular application to Angus Workshops of findings derived from system figures, and vice versa.

wheels from cast-iron, which reduced maintenance work, is one point; that this resulted in a closure of the Wheel Foundry is another; and that it might have reduced employment in general is yet another.

Table 17

Number of Cast-Iron Wheels Produced at Angus Workshops 1948-1961

| Year | Production | Year | Production |
|---|---|---|---|
| 1948..... | 75,954 | 1955..... | 61,658 |
| 1949..... | 71,141 | 1956..... | 60,975 |
| 1950..... | 68,987 | 1957..... | 49,602 |
| 1951..... | 70,197 | 1958..... | 30,140 |
| 1952..... | 68,052 | 1959..... | 41,706 |
| 1953..... | 61,208 | 1960..... | 25,968 |
| 1954..... | 56,536 | 1961..... | 1,990 |

Table 18

Employment in the Wheel Foundry December 1948

| | |
|---|---|
| Chargehands..... | 1 |
| Machinists-metal..... | 1 |
| Electricians..... | 1 |
| Moulders..... | 20 |
| Cranemen..... | 2 |
| Helpers..... | 64 |
| Labourers..... | 3 |
| Miscellaneous..... | 3 |
| Foremen and assist. foremen..... | 2 |
| Clerks..... | 1 |
| Miscellaneous..... | 1 |
| | 99 |

b) Introduction of nailable steel floors in box cars.
The percentage of box cars fitted with nailable steel floors in place of wooden floors has been growing rapidly since the replacement process began in 1951. Table 19 illustrates this growth.

Table 19

Percentage of Box Cars with Nailable Steel Floor Cars

| | |
|---|---|
| 1951 | 0.08 |
| 1952 | 0.71 |
| 1953 | 0.71 |
| 1954 | 0.76 |
| 1955 | 0.80 |
| 1956 | 0.81 |
| 1957 | 0.92 |
| 1958 | 4.77 |
| 1959 | 8.73 |
| 1960 | 13.10 |
| 1961 | 18.62 |

This development originated from the need to counter the tendency of floors to collapse under the pressure of forklift trucks. Such trucks tended to concentrate load weight beyond the withstanding capacity of wooden floors. In a sense, therefore, the accelerated damaging of wooden floors may only have been a temporary phenomenon as the use of forklift trucks developed. However, it is fairly certain that the installation of steel floors has lengthened the life of box car floors beyond what it was when floors were made of wood and the use of forklift trucks was not widespread.

c) Provision of wider doorways on freight cars.
Again, the provision of wider and stronger doorways, designed to give easier access for forklift trucks, has also helped to lengthen the life of freight cars.

d) Replacement of waste packing in truck journal boxes with lubricator pads.
This change reduces the frequency of repacking from intervals of 18 months to about 30 months. In addition, the lubricator pads are inserted at the main shop as a unit and fitting is much easier.

e) Use of plywood instead of V-jointed and beaded wood sheeting in cabooses.
This change facilitates initial application and makes replacement less frequently necessary in contrast with beaded sheeting which tends to dry and crack when heated and necessitates relatively frequent replacement.

f) Installation of non-corrosive metal (aluminum) in floors and flues of refrigerator cars, and change to plywood interiors.

g) Changeover from use of friction type draft gears to rubber type draft gears on cars converted since 1959 and on newly built cars.

h) Equipping of cars with roller bearings instead of friction type bearings.
In effect, items f), g) and h) reduce the amount of maintenance work necessary to keep the units in good condition. The reduction may be only partly felt at line maintenance points where the need for day-to-day inspection and servicing is cut down by more efficient running mechanisms. There is no doubt, however, that such items reduce the major shop repair requirements of cars.

i) Changeover from wooden to steel cabooses.
The proportion of cabooses constructed of steel has been growing over the period covered by the study; at present about 50 per cent of cabooses are of steel. As this proportion grows maintenance requirements are correspondingly reduced.

Meanwhile, the growth in train length and reduction in the number of trains has reduced the number of cabooses needed. The reduction in the inventory of conductors' vans, from 1,264 in 1948 to 1,169 in 1961, provides some evidence of this process.

j) Changeover from box cars with steel frames and wooden exteriors to box cars with wood linings and steel exteriors.

Changes in the level and occupational composition of employment in the Car Department.--It was stated earlier that the available statistics relating to employment in Angus Car Department do not distinguish between the passenger and freight sections of the Department. Thus, the examination of employment changes will be complicated by the decline in passenger car inventory over the period which makes it difficult to indicate the effect of technical changes on employment.

Among the crafts significantly reduced in number between 1948 and 1961, the most obvious are carpenters, painters and upholsterers. However, the anomalous reduction in the total employment of carpenters-freight and the rise in the total employment of carmen need some explanation. First, there has been considerable consolidation of crafts under the general title of carmen, especially in the freight car shops. The expansion of carmen, from 15 in 1948 to 502 in 1961, is an almost complete reflection of this change. At the same time, the decline in carpenters-freight from 433 to 4 is due to the same reclassification. Second, for reasons outlined on page 22, freight carmen have been a highly resilient group in the face of technological change.

Also significant is the reduction in numbers of semi-skilled apprentices and helpers and unskilled labourers between 1948 and 1961. Over the period, the former two groups were reduced in number from 918 to 500; while labourers were reduced from 520 to 336. These groups together account for a total reduction of 602, or almost 50 per cent of the reduction in the Car Department as a whole.

Of course, not all the jobs that have been eliminated were necessarily semi-skilled or unskilled. There may have been a change in the job content of skills in that the management may have agreed to employ

skilled labour on jobs that were formerly unskilled or semi-skilled. But it is certain that not all of the decline in semi-skilled and unskilled labour was due to such policies of management. There is no doubt that the major part of the reduction was due to the direct curtailment in the need for such labour under conditions of technological and other changes.

Stores Department

The Stores Department is dealt with separately because all the factors influencing employment in the maintenance sector appear to have had an effect on employment in the Stores Department. The reduction in passenger service, dieselization, the shift to stainless steel passenger cars, the conversion of box cars to steel, the introduction of new materials handling equipment and changes in organization, have all had an impact on Stores Department employment.

The changes in employment figures between 1950 and 1962 can be seen in Table 20.

As mentioned earlier (see page 26,) the most significant reduction (68.4 per cent of the total or 80 of the 117 redundancies) is in materials handlers. Between October 1950 and September 1962, employment in this group fell from 139 to 59. Factors which have contributed to the reduction in materials handlers are the reduced volume of stores required and the more efficient methods used in the handling of stores. Over the period the volume of stocks on hand fell from $8,944,670 to $6,682,673 (both measured at current prices). This reduction pinpoints a significant factor in the reduced employment needs.

Dieselization.--Quantitatively, the effect of dieselization on Stores' staff has been small. It has served, first, to reduce the amount carried of parts cast at Angus. In the pre-diesel period, extensive manufacturing of parts took place in the Grey-Iron Foundry and the Blacksmiths' Shop and store orders of castings (grates, cylinder-heads, pedestals, liners, etc.) and forgings (side-rods, shackle-bars, motion equipment, etc.) had to be held in stock. At the same time, and as a second effect of dieselization--but operating in the opposite direction--the variety of items held by the Stores has increased. These parts are not manufactured at Angus but are supplied by diesel builders or parts specialists. The fact that these parts are handled manually, whereas steam parts used to be handled by crane, may require more manpower; but against this may be set the fact that, while steam engines, according to class, required parts to be carried in stock specially for them, the much fewer classes of diesel engine call for a smaller variety of intra-group items.

Shift from cast-iron to steel freight car wheels.--The only significance of this change in relation to the Stores Department is that the volume of wheels now held in store is far less than was the case when these wheels were cast at Angus.

Reduction in the amount of lumber needed for repairs with a consequent reduction in the amount of lumber handled by the Stores.--Several reasons may be given for this development. First, the gradual expansion in the use of steel in freight cars has meant a reduction in frequency of damage and repair needs. The growing proportion of steel box cars in the total number of box cars is a factor in this process--the substitution of the steel box cars for steel frame cars has reduced the volume of wood needed for repairs to wooden sides and floors. Second, the amount of lumber needed for repair of passenger cars has fallen as the

TABLE 20

Distribution of Stores Department Employees,
CPR, Angus – October 1, 1950 to September 1, 1962

| Distribution of Stores Employees | Oct. 1/50 | Sept. 1/62 |
|---|---|---|
| DISTRIBUTION OF STORES EMPLOYEES | | |
| Supervisors | | |
| General foreman | 1 | 1 |
| Assistant general foreman | – | 2 |
| Foreman | 8 | 4 |
| Foreman shipper | 1 | 1 |
| Chief receiving clerk | 1 | 1 |
| Total | 11 | 9 |
| Section storekeeper | 11 | 13 |
| Staff storeman | 1 | 1 |
| Shipper | 8 | 4 |
| Shop clerk | 4 | 1 |
| Billing clerk | 1 | 1 |
| Store order clerk | 1 | 2 |
| Receiving clerk | 3 | 2 |
| Chauffeurs | 4 | 4 |
| General foreman clerk | 1 | 2 |
| Tracer clerk | 1 | – |
| Hourly storeman | 51 | 38 |
| Checker | 16 | 5 |
| Electric truck operator | 9 | 10 |
| Dual M.H. & E.T.O. | 2 | 1 |
| Dual M.H. & mech. sweeper | 1 | – |
| Dual M.H. & chauffeur | – | 2 |
| Material handler | 139 | 59 |
| Total | 253 | 145 |
| DISTRIBUTION OF STORES OFFICE STAFF | | |
| Supervisors | | |
| Storekeeper | 1 | – |
| Chief clerk | 1 | 1 |
| Assistant chief clerk | 1 | 1 |
| Head order book clerk | 1 | 1 |
| Head requisition clerk | 1 | 1 |
| Total | 5 | 4 |
| Customs clerk | 1 | 1 |
| Assistant head requisition clerk | 1 | 1 |
| Order book clerk | 5 | 1 |
| Requisition clerk | 2 | 2 |
| Tracer clerk | 2 | 1 |
| Scrap & sales order clerk | 1 | 1 |
| Assistant tracer clerk | 1 | 1 |
| Clerk & stenographer | 3 | 1 |
| Teletype clerk & stenographer | – | 1 |
| Stenographer | 1 | 2 |
| Clerk | 3 | 1 |
| Comptometer operator | 1 | 1 |
| Junior clerk | – | 1 |
| Total | 21 | 15 |
| Grand Total | 290 | 173 |

Position of store order clerk created Aug. 4, 1962.
Position of gen. FM clerk created Aug. 4, 1962.
Position of dual clerk-S.O. clerk abolished Aug. 4, 1962.
Position of checker abolished Aug. 4, 1962.

proportion of stainless steel passenger cars has grown and as the reduction in passenger service has caused redundancy of the older passenger cars over the period.

Mechanization of the materials handling process.--Appendix 8 Part I provides a description of the mechanization of the lumber mill section of the Stores Department. In addition, within the Stores Department, the extended use of pallets and forklift trucks and the use of more versatile trucks have significantly reduced the manual handling of materials.

New packaging techniques have also been developed to eliminate handling. 'Less-than-carload' Stores items are now boxed for transit instead of being shipped loose. Thus individual handling of items is eliminated.

Improvements in inventory control techniques.--Lastly, experience gained in handling, packaging, racking, lighting and inventory analysis has reduced the volume of stores needed to maintain efficient service to user departments.

Studies in relation to programming of inventory requirements have resulted in the development of formulas which are in process of being applied to inventory control. This will give greater efficiency with consequent reduction in the volume of stores required.

## Chapter 5

### Some Significant Employment Determinants and their Impact on Employment in the CPR System

This chapter provides a selective examination of the main changes in both technology and employment that have occurred in the CPR system since 1948. It is an exercise in the quantification of the effects of some employment determinants, including technological change, on employment. Included among the employment determinants are factors that seem to be highly significant for employment in the sector under review. Hence, the tables show not only the changes in technology but also the indexes of industrial production, total passenger car miles and total freight car miles.

Table 21 provides an index of the main technological changes in the CPR system over the period. The inclusion of the three indexes of non-technological change does not presume that all employment determining forces have been exhausted. It is also necessary to regard the following as important influences: the organizational factors of changes in safety requirements as a result of accidents or amendments in government regulations, changes in the quality of equipment, changes in cleanliness and repair requirements (because of more stringent demands on the part of railway users), shifts in the proportion of foreign-owned cars on CPR lines and of CPR cars on foreign lines.

However, the listed factors can be defended in so far as they do include the main technological changes and what are probably the most important changes of a non-technological nature. In the case of $X_{10}$, $X_{11}$, $X_{12}$ and $X_{13}$, lags have been included to illustrate the way in which it is believed pressures on employment will develop over the next few years--all of the changes being employment-reducing.

CPR maintenance-of-equipment employment over the period 1948 to 1961 is shown in index form in Table 22. It will be seen that regressions have been computed which provide the following relationships between the different broad employee groups. Expressing $Y_1$ as foremen, $Y_{10}$ as skilled labour, $Y_{12}$ as semi-skilled labour, $Y_{13}$ as unskilled labour, and $Y_{14}$ as total maintenance-of-equipment labour, the computed relations are:

$$Y_{10} = -5879 + 15.3\ Y_1$$
$$Y_{10} = 18.8 + 0.889\ Y_{12}$$
$$Y_{10} = 249.0 + 2.03\ Y_{13}$$
$$Y_{10} = -1 + 0.47\ Y_{14}$$

This means that (over the period 1948 to 1961) as a change of 100 men occurred in the skilled component of the total employment in maintenance of equipment in the CPR, the semi-skilled component changed by 112.4 men, the unskilled component by 49.3 men, and the supervisory grades by 6.5 men, all movement being in the same direction.

To some extent, this statement of relationship is borne out by the fact that, as Table 5 shows, the skilled trades reduction constituted 38.3 per cent of the total reduction, the semi-skilled 35.6 per cent, and the unskilled 25.5 per cent. It can, therefore, be realistically stated that the changes of the post-war years have significantly affected the skilled tradesmen and their helpers.

TABLE 21

Employment Determinants (with appropriate lags) Affecting Maintenance of Equipment Employment on CPR System, 1948–1961

| | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-Technological Determinants | | | | | | | | | | | | | | | | | | |
| $X_1$ Index of industrial production ..... | 96.4 | 100.0 | 106.9 | 116.6 | 120.9 | 129.1 | 128.5 | 142.3 | 154.9 | 155.4 | 154.4 | 166.1 | 167.4 | 172.9 | | | | |
| $X_2$ Index total passenger car miles .... | 101.5 | 100.0 | 96.5 | 98.8 | 102.3 | 103.8 | 101.2 | 101.5 | 98.5 | 90.6 | 85.0 | 78.6 | 69.6 | 58.4 | | | | |
| $X_3$ Index total freight car miles ..... | 99.2 | 100.0 | 94.4 | 106.0 | 111.0 | 106.4 | 93.1 | 100.0 | 114.2 | 102.0 | 100.1 | 97.0 | 98.4 | 98.4 | | | | |
| Technological Determinants | | | | | | | | | | | | | | | | | | |
| $X_4$ Per cent tractive power provided by diesel and electric units ..... | 5.0 | 7.7 | 10.9 | 13.1 | 14.3 | 19.7 | 22.5 | 27.5 | 45.4 | 55.9 | 64.5 | 73.1 | 80.6 | 88.7 | | | | |
| $X_5$ Index Number of cast iron wheels products ..... | 100.0 | 93.7 | 90.8 | 92.4 | 89.6 | 80.6 | 74.4 | 81.2 | 80.3 | 65.3 | 39.7 | 54.9 | 34.2 | 2.6 | | | | |
| $X_6$ Index castings products (lbs) (excl. cast wheels) ..... | 100.0 | 92.8 | 77.8 | 86.1 | 82.6 | 75.4 | 51.7 | 46.1 | 54.0 | 27.6 | 12.0 | 17.1 | 12.9 | 5.8 | | | | |
| $X_7$ Reduction in work week from 44 to 40 hours ..... | 44 | 44 | 44 | 41.75 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | | | | |
| $X_8$ Per cent box cars composed of nailable steel floor cars ..... | 0 | 0 | 0 | .08 | .71 | .71 | .76 | .8 | .81 | .92 | 4.77 | 8.73 | 13.1 | 18.62 | | | | |
| $X_9$ Average age of rolling stock: | | | | | | | | | | | | | | | | | | |
| a) Diesel locomotives ..... | 2.2 | 2.2 | 2.4 | 2.9 | 3.2 | 3.5 | 3.6 | 3.9 | 4.2 | 4.3 | 4.7 | 5.3 | 6.1 | 7.1 | | | | |
| b) Freight cars ..... | 23.2 | 23.0 | 22.9 | 21.8 | 19 | 19.9 | 19.4 | 19.2 | 18.3 | 17.4 | 17.2 | 17.1 | 17.3 | 17.4 | | | | |
| c) Passenger cars ..... | 30.3 | 30.6 | 30.4 | 31.3 | 31.5 | 30.7 | 29.9 | 29.3 | 28.6 | 27.2 | 26.3 | 25.3 | 24.6 | 24.0 | | | | |
| $X_{10}$ Per cent passenger cars composed of stainless steel cars (2-year lag) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.3 | 6.5 | 7.7 | 9.2 | 10.6 | 11.9 | 13.2 | 14.2 | | |
| $X_{11}$ Per cent of freight wheels made of steel (4-year lag) ..... | 0 | 0 | 0 | 0 | 0 | 3.14 | 5.46 | 8.51 | 9.99 | 12.18 | 14.63 | 15.88 | 15.14 | 20.92 | 35.57 | 32.87 | 50.08 | 75.09 |
| $X_{12}$ Per cent conductors' vans of steel construction (4-year lag) ..... | 0 | 0 | 0 | 0 | 1.0 | 10.2 | 10.3 | 10.4 | 10.6 | 13.8 | 17.0 | 17.2 | 17.5 | 17.8 | 18.1 | 18.7 | 19.7 | 20.6 |
| $X_{13}$ Per cent of box cars made of steel (exterior and frame) (4-year lag) .... | | | | | 42.6 | 45.4 | 49.1 | 56.2 | 59.9 | 66.0 | 70.7 | 75.1 | 79.3 | 83.7 | 87.0 | 90.0 | 92.6 | 94.3 |

TABLE 22

Indexes of Maintenance of Equipment Employment at CPR, 1948–1961

| | Maintenance of Equipment Employment on CPR | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $Y_1$ | General foremen, foremen and assistant foremen | 100.0 | 104.3 | 103.2 | 112.7 | 122.3 | 123.4 | 117.0 | 113.0 | 110.0 | 111.3 | 103.6 | 101.4 | 98.6 | 96.0 |
| | Skilled | | | | | | | | | | | | | | |
| $Y_2$ | Blacksmiths | 100.0 | 101.8 | 95.2 | 99.6 | 115.1 | 118.0 | 85.3 | 72.4 | 70.6 | 65.8 | 53.3 | 47.4 | 42.6 | 42.6 |
| $Y_3$ | Boilermakers | 100.0 | 100.2 | 89.3 | 91.1 | 96.1 | 96.1 | 75.1 | 69.8 | 81.0 | 61.8 | 45.8 | 39.4 | 25.9 | 25.4 |
| $Y_4$ | Carmen, coach and locomotive | 100.0 | 108.1 | 114.7 | 120.8 | 137.5 | 134.7 | 93.5 | 90.8 | 101.2 | 90.7 | 79.0 | 69.1 | 59.3 | 56.9 |
| $Y_5$ | Carmen, freight | 100.0 | 108.0 | 104.7 | 129.7 | 145.7 | 146.3 | 125.1 | 133.3 | 134.6 | 132.9 | 118.1 | 111.4 | 105.1 | 102.0 |
| $Y_6$ | Electrical workers | 100.0 | 103.6 | 104.0 | 112.6 | 131.9 | 132.0 | 122.3 | 133.8 | 157.6 | 171.9 | 167.1 | 169.8 | 154.3 | 148.8 |
| $Y_7$ | Machinists | 100.0 | 98.2 | 93.4 | 101.8 | 109.2 | 109.5 | 89.9 | 87.0 | 97.4 | 87.0 | 74.8 | 68.7 | 60.4 | 58.1 |
| $Y_8$ | Moulders | 100.0 | 98.4 | 90.5 | 90.5 | 93.7 | 95.2 | 66.7 | 61.9 | 73.0 | 61.9 | 44.4 | 47.6 | 39.7 | 17.5 |
| $Y_9$ | Pipefitters and sheet-metal workers | 100.0 | 109.1 | 107.2 | 114.6 | 133.6 | 128.3 | 97.6 | 101.0 | 105.8 | 99.0 | 84.4 | 82.9 | 72.8 | 68.3 |
| $Y_{10}$ | Total | 100.0 | 104.4 | 101.9 | 114.8 | 128.1 | 127.7 | 103.2 | 104.7 | 112.0 | 105.6 | 92.5 | 86.5 | 77.9 | 75.0 |
| | Semi-Skilled | | | | | | | | | | | | | | |
| | Stationary engineers, firemen and oilers | 100.0 | 98.0 | 99.7 | 106.0 | 111.3 | 109.9 | 101.0 | 99.3 | 109.6 | 99.3 | 96.4 | 94.7 | 86.1 | 82.1 |
| $Y_{11}$ | Helpers to mechanics | 100.0 | 103.0 | 96.8 | 108.7 | 122.1 | 118.9 | 96.0 | 95.8 | 105.2 | 97.7 | 84.6 | 76.8 | 65.0 | 60.4 |
| | Apprentices | 100.0 | 101.8 | 94.8 | 99.3 | 112.5 | 113.8 | 101.3 | 88.6 | 85.6 | 78.6 | 71.8 | 67.3 | 59.4 | 52.1 |
| $Y_{12}$ | Total | 100.0 | 102.4 | 96.6 | 107.0 | 119.8 | 117.4 | 97.2 | 94.8 | 102.2 | 94.5 | 83.2 | 76.3 | 65.4 | 60.4 |
| | Unskilled | | | | | | | | | | | | | | |
| | Coach cleaners | 100.0 | 102.2 | 94.2 | 100.0 | 104.1 | 105.5 | 106.3 | 103.9 | 105.4 | 106.6 | 97.8 | 92.5 | 85.0 | 78.2 |
| | Classified labourers (shops, enginehouses and power plants) | 100.0 | 99.2 | 95.1 | 108.9 | 117.2 | 121.2 | 117.8 | 115.8 | 115.9 | 111.3 | 89.0 | 77.8 | 68.3 | 61.3 |
| | Unclassified labourers (shops, enginehouses and power plants) | 100.0 | 103.3 | 96.6 | 110.4 | 121.8 | 120.5 | 97.3 | 100.4 | 105.5 | 102.9 | 96.6 | 91.2 | 71.1 | 64.4 |
| $Y_{13}$ | Total | 100.0 | 101.5 | 95.5 | 107.5 | 116.1 | 117.4 | 107.0 | 107.0 | 109.3 | 106.9 | 94.0 | 86.5 | 73.2 | 66.3 |
| $Y_{14}$ | TOTAL – Maintenance of equipment employment | 100.0 | 103.2 | 99.1 | 110.9 | 122.9 | 122.4 | 103.1 | 103.0 | 108.7 | 103.2 | 90.9 | 84.5 | 74.5 | 70.1 |
| | TOTAL – CPR employment | 100.0 | 101.8 | 98.6 | 105.5 | 110.2 | 109.8 | 99.7 | 99.5 | 103.3 | 101.4 | 93.1 | 89.1 | 82.7 | 77.5 |

Turning now to Table 23, the correlation coefficients which are given suggest the degrees of relationship sustained between selected employment determinants and levels of employment. In the three significant determinants, it is evident that certain classes of labour are significantly associated with particular determinants in so far as a high degree of sympathetic movement exists between them. This is the case between total passenger-car miles and coach and locomotive carmen. The highly suggestive coefficients associated with the dieselization program underline the impact of the program on the trades of blacksmith, boilermaker, electrician and machinist.

Table 23

Coefficients of Correlation (r) Between Selected Employment Determinants and Employment in Different Occupations and Skilled Groups, 1948-1961

(Based on indexes Shown in Tables 17 and 18)

| Employment Determinant | Employee Group | r |
|---|---|---|
| Total passenger car miles.. | ( Carmen, coach & locomotive | + .84 |
| | ( Total skilled labour | + .75 |
| Total freight car miles.... | ( Carmen freight | + .66 |
| | ( Total skilled labour | + .56 |
| Per cent tractive power diesels..... | ( Blacksmiths | - .93 |
| | ( Boilermakers | - .96 |
| | ( Electrical workers | + .84 |
| | ( Machinists | - .90 |
| | ( Total skilled labour | - .65 |
| Index cast-iron wheels produced..... | ( Moulders | + .96 |
| Index castings produced.... | ( Moulders | + .96 |

The relatively low coefficient sustained between total freight-car miles and freight carmen continues to present an anomaly, and, as previously stated,[1] we can only hint at possible causes. Clearly, the inclusion of technological changes would enhance this anomaly since the changes are all labour saving in terms of freight carmen. This leads to the conclusion that the factors previously suggested have increased the figure for freight carmen employed per freight-car-mile run.

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[1] See pages 22-23.

The only other correlations between employment determinants and employment totals that have been possible and in any way suggestive are those between the indexes of cast-iron wheels and castings produced, and the index of moulders. In both instances, a coefficient of +.96 is shown. Again, it must be emphasized that too much should not be read into this figure, the only purport of which is that these indexes do move in a highly sympathetic way. It should be noted that the reduction of 82.5 per cent in moulders employed constitutes only 0.9 per cent of the total change in maintenance of equipment employment between 1948 and 1961. This means that the indexes of cast-iron wheels and of castings produced possess little relevance even for skilled labour; in all, only 52 skilled employment positions among moulders have been directly affected.

A Regression of Employment on Final Output

The correlation figures probably exaggerate the dependence of the employment variables on the determinants. No allowance has been made for probable intercorrelation between the different index series. A more refined correlation analysis would no doubt have achieved a more accurate degree of such dependence.

The dependence of employment on railway output would be particularly interesting for two reasons. First, it is the main determinant of railway employment. Second, it is a constant factor--the other changes, e.g., dieselization conversion to steel wheels, occur once only and, therefore, except for their role in determining trend changes are interesting only prior to and while they are occurring.

This has been acted on and the development of the dependence relation of employment on final output has been sought. The figures used are those of Table 3.

The regression of employment changes on output changes gives the following results:2/

$$E = -12.57 + 1.09\ (Q)$$

As pointed out in Diagram 1, this equation is statistically significant. However, it should be noted that the regression is linear and, therefore, does not take into account bunching of increases or decreases in variables. This does not seem to be significant so far as output is concerned because increases and decreases are distributed fairly evenly over the period. But the employment decreases tend to be concentrated near the end of the period and the 1961 negative trend may be higher than our regression suggests.

2/ Using first-differences data a correlation coefficient of + .75 appears between changes in final CPR output and total CPR employment. To describe the employment relationship we can use an equation of the form:

$$E = C + f\ (Q)$$
which can be rewritten
$$E_t - E_{t-1} = C + f\ (Q_t - Q_{t-1})$$

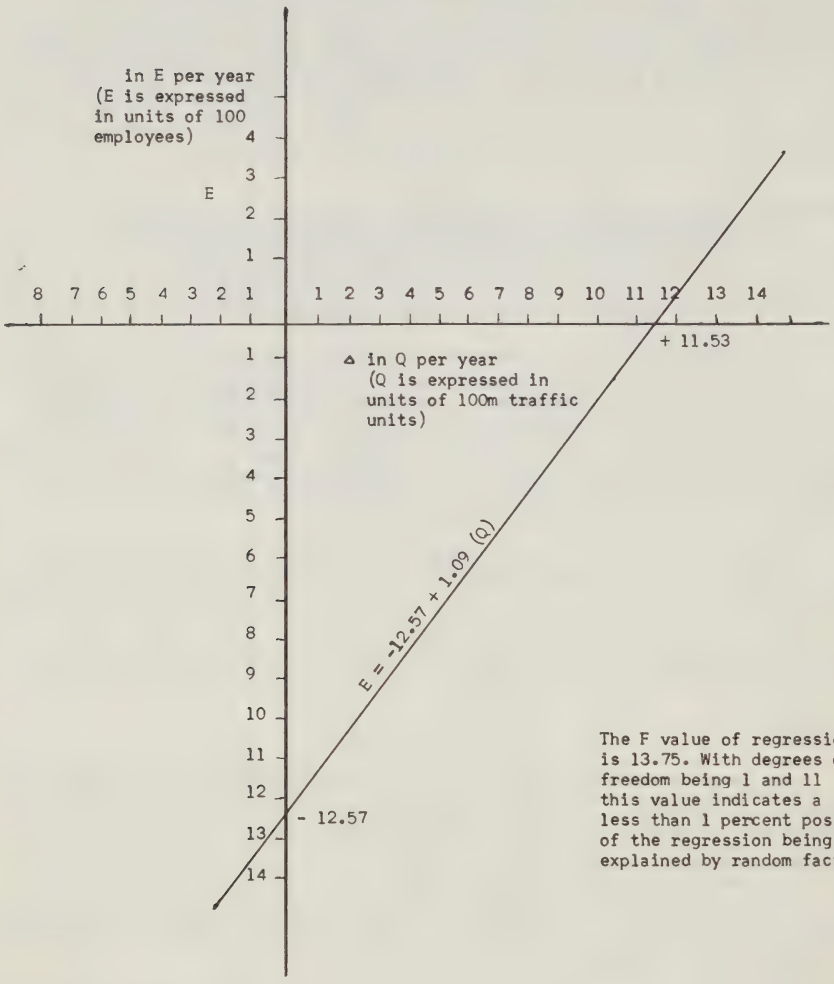
The second alternative is preferable because it overcomes to a considerable extent the problem of serial correlation, i.e., where both E and Q are determined by some other exogenous factor.

In the equation, E is employment, Q is output, C is a constant term which quantifies trend values in E and/or Q, f is a coefficient establishing dependence of E on Q, and t and t-1 are symbols for any year and the previous year respectively.

Diagram 1

The Regression Line for Employment on Output in C.P.R., 1948 - 1961

Δ = Change




The F value of regression is 13.75. With degrees of freedom being 1 and 11 this value indicates a less than 1 percent possibility of the regression being explained by random factors.

Subject to the fact that the regression equation explains only 56 per cent of employment changes, this equation tells us:

1. If final output is constant, then employment will fall each year by 1,257 men.3/

2. If there were no trend factor in employment (or output), an increase of 100 million traffic units in a year over the previous year would be accompanied by an increase of 109 employees.

3. In comparing any year with the previous year, employment will be greater, equal or smaller, as output increases by more than, equals or is less than 1,153,000,000 traffic units.

It is emphasized that the sample of years covered by the above data is small, and it is possible that if more years were covered, this relationship between output and employment would differ from that recorded in the equation. However, the degree of significance of our conclusion is statistically acceptable in that it indicates we have a right to deny that the relationship can be explained by random factors.

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3/ The use of the intercept value as the trend value slightly exaggerates the trend value over its true value. This is because in the regression of first-differences all trends are built into the intercept. The output data used also show a trend of $-130_m$ traffic units per year. Extracting the influence of this from the employment trend value would reduce the latter to a trend reduction figure of around 1,100 men per year. However, as was suggested previously, this figure may understate the current trend rate of employment reduction for other than the output factor.

The coefficient of determination $R^2$, which is derived from the data, attributes 56 per cent of the changes in the regressed group (E) to the trend factor and the changes in output. This figure is somewhat less statistically reliable than the regression because of the large size of the standard deviations of the means of the changes in relation to the means of the changes themselves. As it stands, it leaves some 44 per cent of the changes in E as attributable to other, possibly random, factors. A longer period would possibly reduce the residual element, but some of it can be explained by the fact that a sizeable portion of the Company's staff in which there is hardly any trend (clerical, supervisory and professional staff) is not affected by output change; also, there is certainly some lag in adjustment of employment to output change. By subdividing the employee group, using quarterly data over a longer period, by having a more even distribution of increases and decreases in employment over the period, and by finding an appropriate lag, it would be possible to raise this coefficient.

However, the purpose here has not been to get maximum precision (except within constraints of time, resources and terms of reference), but rather to indicate general magnitudes in relationships.

Table 24

C.P.R. Output and Employment 1948-1961

| | Total C.P.R. Traffic Units (000,000) | Annual Changes in Output (000,000) | Total C.P.R. Employment | Annual Numerical Change in Employment |
|---|---|---|---|---|
| 1948 | 30,509 | | 82,206 | |
| 1949 | 29,588 | - 921 | 83,672 | +1,466 |
| 1950 | 27,417 | -2,171 | 81,040 | -2,632 |
| 1951 | 31,904 | +4,487 | 86,765 | +5,725 |
| 1952 | 34,194 | +2,290 | 90,619 | +3,854 |
| 1953 | 32,407 | -1,787 | 90,232 | - 387 |
| 1954 | 27,926 | -4,481 | 81,994 | -8,238 |
| 1955 | 29,857 | +1,931 | 81,776 | - 218 |
| 1956 | 34,784 | +4,927 | 84,924 | +3,148 |
| 1957 | 31,229 | -3,555 | 83,348 | -1,576 |
| 1958 | 30,100 | -1,129 | 76,509 | -6,839 |
| 1959 | 28,968 | -1,132 | 73,277 | -3,232 |
| 1960 | 28,468 | - 500 | 67,973 | -5,304 |
| 1961 | 28,818 | + 350 | 63,694 | -4,279 |

## Summary of Part I and General Findings

### 1. Scope of Part I

Part I of the study presents an analysis of the effects of technological change on maintenance of equipment employment for the C.P.R. system as a whole over the period 1948 to 1961 and, within this broader context, discusses in depth the changes that have taken place at the Angus Workshops in terms of their employment and occupational effects.

The report is primarily concerned with those technological changes which have had a direct impact on maintenance of equipment employment. It does not have the wider objective of tracing the effects of innovations outside the railway industry, such as in road transport, which indirectly, but no less significantly, influence the level and structure of employment in the railway shops; nor does it deal with the way in which changes in the railway shops have affected employment in other industries.

The two broad types of changes considered are mechanical and organizational. Mechanical changes include the introduction of new equipment, new types of power or new materials. Organizational changes are those which contribute to the greater efficiency of maintenance operations, as for example, the concentration of major maintenance work which has been made possible because of the dieselization of railway motive power.

The Angus Shops are one of three main repair shops in the C.P.R. system. In 1961, Angus accounted for 28.2 per cent of total maintenance employment in the C.P.R. system. A study of the Angus Shops is therefore significant in showing the influence of technological change on maintenance operations employment. The high degree of correlation existing between the employment data for Angus and that for total maintenance employment on the C.P.R. further extends the usefulness of the findings.

### 2. Major Organizational Changes at Angus, 1948-1961

Plant capacity working on passenger car repairs was reduced to one quarter that of 1948. This compares with a decline of 50 per cent in passenger service over this period.

The Wheel Foundry (cast-iron) was closed in 1960 due to the changeover to steel wheels purchased from outside firms.

The Cabinet Shop was consolidated with the Lumber Mill for reasons of efficiency and a decline in work volume.

The Reclaiming Dock was greatly expanded because improved reclaiming techniques had made this operation more profitable and practicable.

The Locomotive Millwright Shop was merged with the Locomotive Shop as a result of the conversion from steam to diesel motive power.

Within the Locomotive Shop, the process of dieselization led to the disappearance of the Tender Shop and the Brass Shop, and the establishment of the Diesel-Erecting Shop and the Locomotive Electric Shop. The Air-Brake Shop and Air-Compressor Shop were established in the Locomotive Shop, taking over work previously done in small shops in both the Car and Locomotive Departments.

The Car Electric Shop was greatly expanded owing to the increase in electrical fittings and the heavier generators used in the newer passenger cars.

3. Long Term Employment Trends

Total employment in the C.P.R. decreased from 82,200 in 1948 to 63,700 in 1961, falling by a significant 22.5 per cent. Maintenance of equipment employment fell even more sharply, from 17,600 to 12,400, a decline of 29.9 per cent.

Within the Angus Shops, total employment over the same period fell by 43.9 per cent.

4. C.P.R. Traffic Volume

Between 1947 and 1961, inter-city revenue ton miles for the C.P.R. increased by only 1.0 per cent and revenue passenger miles declined sharply by 49.8 per cent. It is against such a pattern of relative and absolute declines in traffic volume that the process of technological change in the maintenance of equipment sector of the industry needs to be viewed.

5. Productivity Trends

Productivity trends help to reflect the labour-saving aspect of the technological changes that have taken place. The most comprehensive single indicator of freight train performance is that of gross ton-miles per freight train hour. Between 1947 and 1959 this measure showed an increase of 66.1 per cent.

Further evidence of the rise in labour productivity is the fact that traffic units per employee in the C.P.R. as a whole increased over the period by 34.2 per cent, while the productivity of maintenance equipment employees increased by 34.7 per cent. The rise in the labour productivity of maintenance workers means that a smaller number of workers are required to maintain a given volume of traffic. Moreover, the fact that actual traffic has also declined over the period adds to the adjustment problems which the industry has experienced.

6. Trends in the Structure of Maintenance of Equipment Employment in the C.P.R. System

Over the period 1948 to 1961, foremen declined by 4.0 per cent, skilled workers by 25.0 per cent, semi-skilled workers by 39.6 per cent, and unskilled workers by 33.7 per cent.

Occupations that showed the greatest decrease were blacksmiths, boilermakers and moulders, in that order, followed by apprentices, carmen (coach and locomotive) and machinists, also in that order. Increases in employment over this period were only recorded for electrical workers (49 per cent) and freight carmen (2 per cent).

More significant than these percentages is the extent to which the different sub-groups accounted for the drop in total employment. For example, the semi-skilled group (which includes the predominant helpers to mechanics group) whose employment fell by 39.6 per cent accounted for 26.0 per cent of the total reduction of staff; the unskilled group (labourers--classified and unclassified) for 20.7 per cent of the reduction; machinists for 16.4 per cent; and moulders for 0.9 per cent.

In considering the relative influences of traffic volume and technological changes on the employment levels of maintenance occupations, it is noted that both these factors have adversely influenced employment of coach and locomotive carmen, blacksmiths, pipefitters and sheet-metal workers, helpers to mechanics, and labourers (classified and unclassified). On the other hand, the decline in employment history of machinists, moulders

and boilermakers over the period shows a low reaction to changes in traffic volume, suggesting strong technological influences on the level of their employment.

At first glance, freight carmen seem to have been a highly resilient group. One of the reasons for this is that during the period under review, cars which might have required only relatively light repair have been rebuilt to incorporate the latest ideas, exerting an upward pressure on the employment of freight carmen. For the future, it may be expected that the decreased maintenance requirements of modernized freight cars, together with improved work methods, may exert a greater downward pressure on the employment of freight carmen.

7. Trends in the Structure of Employment at Angus Workshops

Over the period 1948 to 1961, employment at Angus declined from 6,200 in 1948 to 3,500 in 1961. The number of skilled workers declined by 1,300 or 44.8 per cent; semi-skilled workers by 900 or 52.4 per cent; and unskilled workers by 450 or 37.4 per cent.

As a percentage of the total employment decline at Angus, the skilled group accounted for 48.4 per cent of the decrease; the semi-skilled for 33.5 per cent; and the unskilled for 16.4 per cent.

Among the occupational groups which declined very significantly over this period and which also played a significant part in the total reduction of employment were the following:

| | |
|---|---|
| Machinists | - 47.7 per cent |
| Boilermakers | - 84.0 per cent |
| Pipe Steamfitters | - 37.7 per cent |
| Sheet-Metal Workers | - 47.9 per cent |
| Carpenters, Coach | - 64.5 per cent |
| Painters | - 52.5 per cent |
| Apprentices | - 62.0 per cent |
| Helpers | - 51.4 per cent |
| Labourers | - 37.5 per cent |

Among the shop floor workers, electricians were the only occupational group which showed an increase, rising by 23.3 per cent.

Clerical and supervisory staff registered the smallest decline, falling by 14.6 per cent over the period. The much smaller decline in supervisory staff relative to that in the skilled, semi-skilled and unskilled groups points to the conclusion that the degree of supervision has become more concentrated at Angus over the period.

In looking at the broad shifts in employment composition at Angus over time (for the third quarter of six selected years), several notable points emerge. Skilled workers have maintained their position as the largest group at Angus. In 1948 they made up 46.2 per cent of total employment and in 1961, 46.3 per cent. Semi-skilled workers declined from 28.3 per cent to 23.4 per cent of total employment over the same period, but still formed the second largest group. Unskilled workers rose from 19.5 per cent to 22.1 per cent. Clerical and supervisory workers increased from 5.8 to 8.2 per cent.

The unskilled and clerical and supervisory groups experienced a greater average stability of employment compared with the other categories. Semi-skilled work was the most responsive to traffic variations. One of the main reasons for this is the predominance of the helpers' class in

this group. The helpers' class has played a significant part in the cyclicality and downward trend of employment at Angus--26.2 per cent of the total reduction in Angus employment between 1948 and 1961 may be attributed to helpers alone.

The skilled helpers' ratio has increased for most skilled groups (with the exception of painters and sheet-metal workers). This would tend to indicate that the skill mix has increased. If, however, we include labourers in the skill mix, their increased proportion of total employment leads to the conclusion that the skill mix has fallen. On the other hand, if clerical and supervisory workers are also included, this would tend to raise the skill level.

8. Types of Technological Changes in Maintenance of Equipment Operations at Angus

The main broad types of technical change which have significantly affected maintenance-of-equipment operations in the post-war years are the following:

new sources of motive power;
new rolling stock equipment;
new materials used in maintenance;
new maintenance techniques and equipment.

Specific technical changes which are common to the three shops at Angus include:

new and more effective hand tools;
expanded use of fork-lift trucks and "track-mobile" equipment which has greatly increased labour productivity in packing, storing, and carrying of materials;
air jacks and hydraulic jacks, which facilitate the removal of freight and passenger car trucks;
electric and air hoists to replace the hand chain blocks;
replacement of steam cranes by diesel cranes;
vapour degreasing units for the cleaning of components;
improved synthetic materials, such as paints, enamels and varnishes.

Other changes which have influenced maintenance operations and techniques at Angus are:

(a) A significant reduction in equipment brought in for repair has resulted in the consolidation of departments within the shops and in more intensive use of machinery; e.g., in 1961, the air brake departments of the Locomotive, Passenger, and Freight Shops were consolidated for economy purposes in the Locomotive Shop.

(b) Work has been reorganized to allow for a greater degree of assembly-line production. A prime example of this trend is the switch from steam to standardized diesel engines, which has greatly expanded the possibility of making locomotive maintenance a continuous process form of production. As a result of this development, average shop time for diesel locomotives is five days compared to 18 days for steam locomotives.

(c) The greater standardization of parts also now makes it possible to do more maintenance in line shops on such equipment as

diesel locomotives, rail diesel cars, and stainless steel passenger cars, thus reducing the need to bring such equipment into the major repair shops.

Broad Effects of Dieselization on Shop Employment

The level of maintenance equipment employment has been adversely affected by the reduction in the number of units to be maintained. Between 1948 and 1961, the number of locomotives on the C.P.R. declined by 586, a reduction of 31.9 per cent. The decline in traffic volume accounts in part for the use of fewer locomotives. Of greater importance in this trend, however, is the fact that fewer diesel locomotives are needed to provide a given volume of traffic.

The conversion to diesel power has also had a major impact on maintenance needs and methods in a number of other significant ways:

> Diesel engines require less extensive servicing and can be operated for much greater distances than steam engines before major servicing is needed. For example, passenger steam locomotives averaged 125,000 miles between main shop repairs, and freight steam locomotives, 80,000 miles. Comparable figures for diesels are 500,000 miles and 125,000 miles.
>
> Standardization of parts on diesels has resulted in faster maintenance work, and allows more repair work to be performed in the line maintenance shops.
>
> The use of diesels has resulted in a significant increase in the contracting-out of parts manufacturing. The diesel program has eliminated much of the parts manufacturing that went on at Angus when steam was the main form of tractive power. The discontinuation of parts manufacturing has been very much related to parts standardization.

In the light of all these factors, it is evident that dieselization has been a major contributing factor in the decline of maintenance equipment employment at Angus Shops and elsewhere.

9. Changing Occupational Patterns at Angus Shops

Locomotive Shop.--There has been a reduction in charge hands and assistant foremen, but there has been a considerable upgrading of supervisory staff.

Brass machinists have disappeared from the list of occupations.

The decline in metal machinists is partly the result of electricians replacing machinists in the Diesel-Erecting Shop, where the diesel units are repaired, and to a greater extent the result of purchasing metal parts from outside.

The relatively small decline in the number of blacksmiths is due to the fact that the volume of work has remained fairly stable, despite the reduction in forge work and the number of locomotive units.

Dieselization has led to a sharp reduction in the number of boilermakers and steam pipefitters and a marked increase in the number of electricians.

The reduced need for castings and the shift to outside purchasing of parts severely affected moulders. Their numbers were reduced sharply in the Grey Iron Foundry, and the Wheel Foundry was closed.

Labourers and helpers together fell from 34.7 per cent of total employment in the Locomotive Shop in 1948 to 27.5 per cent in 1961. This group accounted for 41.8 per cent of the total reduction in employment in the Locomotive Shop.

Passenger Car Shop.--Two changes have been especially important in the reduction of maintenance requirements in the Passenger Car Shop. The first is the marked reduction in the number of passenger trains. This is partly due to changing technology, which enables fewer passenger cars to provide a given volume of passenger service. Far more significant is the reduction due to a decline in the volume of passenger service.

A second reason is the introduction of the stainless steel passenger car in 1954. Between 1954 and 1961, the proportion of such cars rose from 3.3 per cent to 14.2 per cent. Stainless steel cars require less maintenance and permit more on-line repair work.

Two effects have resulted from the reduction in the number of passenger trains. First, there is a decreased requirement for major shop repair work. Second, the redundant cars have provided spare component parts, such as generators, electrical fittings, and upholstered seats, thus cutting down the need to repair damaged components on cars in operation. The availability of these parts also allows for more on-line maintenance, and thus lessens the need for major repair shop work.

Prior to 1955, passenger cars were, as a rule, brought in for general repairs every two years. This was altered to every 240,000 miles between main shoppings, so that many cars may now be out for four years before they undergo general repairs. The lengthening of the inter-shopping periods has reduced car handling in the shops. The greater emphasis on minor repairs and parts replacements at line maintenance points, due to the introduction of stainless steel cars and the greater usage of replaceable parts, has also had the same effect.

These changes have had marked employment effects on painters, coach carpenters and upholsterers. Despite the growth in the amount of electrical work now required on passenger cars, there was a 50 per cent reduction in the number of electricians employed in the Car Electric Shop, mainly because of the reduction in the number of cars to be maintained and the lengthening of inter-shopping periods.

Freight Car Shop.--In contrast to almost all other sectors of the railway's operation, the volume of freight carried has risen between 1948 and 1960--from 59 million to 65 million revenue ton miles--and the number of freight cars has also increased considerably. Despite the extensive technological changes in freight car repair work, the index of freight car men employment for the whole C.P.R. system rose from 100 in 1948 to 102.0 in 1961.

The following are some of the technical changes which have exerted a downward pressure on maintenance employment in the Freight Car Shop at Angus:

> The shift from cast-iron to steel wheels, which have greater durability and a longer life.

The increased use of steel floors instead of wooden floors on boxcars; aluminum flooring and flues, and plywood interiors on refrigerator cars; steel boxcars and cabooses.

Less frequent packing of truck journal boxes because of the use of lubricator pads instead of waste packing.

Conversion to rubber-type draft gears on cars from friction-type draft gears; and the use of roller bearings instead of friction-type bearings.

The reduction in the number of cabooses required owing to longer train lengths.

Occupational Changes.--The available statistics regarding employment in Angus Car Department do not distinguish between passenger and freight sections of the Department. It is evident that among the crafts in the Car Department as a whole, carpenters, painters and upholsterers have been significantly reduced in number.

It should be noted that there has been considerable consolidation of crafts in the Car Department, including that of carpenters, freight, under the general title of "carmen". This explains, to a large extent, the rise in the number of carmen in this department from 15 in 1948 to 502 in 1961, and a decline in carpenters, freight, from 433 to 4. It should be noted further, in explaining the rise in the number of carmen that, for reasons given previously, freight carmen were highly resilient in the face of technological changes over this period.

Stores Department.--All the factors influencing employment in the maintenance sector have had an employment effect on the Stores Department. Materials handlers were the most adversely affected, accounting for 68.4 per cent of the total reduction in employment.

10. General Findings

It can be said, with a fair degree of certainty, that the main determinant of the changes in maintenance of equipment employment at Angus and elsewhere in the system has been a major change in the techniques of production. These improved techniques have had the following broad consequences:

1. They have resulted in a decrease in the number of man-hours worked in the production of any given output and in a decrease in the number of employees required for a given output. The changes in techniques of production have thus meant an increase in the productivity of labour.

2. The increase in the productivity of labour has resulted mainly from an increase in the quantity of quality of equipment capital employed per unit of labour and from changes in the organization of work.

3. The reduction in personnel has increased the average quality of labour by increasing the average length of service of the remaining labour force.

4. In the light of the technical changes that have occurred and their employment effects, stability of employment, as well as expanding employment, will depend in future on increased output. This increase in output will have to be a continuing one because the shift to labour-saving techniques is an on-going process.

5. Some of the technical changes which have reduced maintenance of equipment employment have increased employment outside the railway industry. Equipment that was formerly made in the shops is now purchased from outside firms. Parts that were formerly repaired by shop employees are now replaced by standard unit parts purchased from outside firms. The study has given specific examples of this practice. There may be examples of changes which have had the reverse effect, that is, work performed in the shops that was previously done by outside companies, but there is no doubt that the former has predominated.

However, the employment reduction can be only partly explained away by the contracting-out of work. The vast majority of job opportunities affected have disappeared and will only be retrieved, at least to some extent, by increases in output.

6. It would appear that the skill content of Angus work has increased. This emerges from the fact that: a) the ratio of skilled to semi-skilled workers has increased, and b) these two groups together make up over 80 per cent of total Angus employment.

7. There have been strong forces operating in the industry which have been changing the production functions (capabilities) of the industry and its techniques of production. On balance, these changes are highly labour-saving. Given this trend, the failure of total output to expand becomes responsible for the decline in railway employment over the period studied.

# APPENDICES

# TO

# PART I

APPENDIX 1

Gross Capital Expenditure – Rolling Stock
Years 1947 – 1961

| Year | Motive Power | | | Freight cars | Passenger cars | Work Equipment | Total |
|---|---|---|---|---|---|---|---|
| | Diesel | Steam | Total | | | | |
| | | | $ | $ | $ | $ | $ |
| 1947 | 1,510,324 | 833,161 | 2,343,485 | 19,778,940 | 2,636,308 | 1,277,211 | 26,035,944 |
| 1948 | 3,413,943 | 8,261,012 | 11,674,955 | 23,752,845 | 3,606,570 | 320,207 | 39,354,577 |
| 1949 | 7,220,079 | 2,330,631 | 9,550,710 | 25,331,601 | 9,391,705 | 285,415 | 44,559,431 |
| 1950 | 12,415,418 | 25,052 | 12,440,470 | 14,571,405 | 7,096,823 | 696,670 | 34,805,368 |
| 1951 | 8,279,543 | 14,089 | 8,293,632 | 39,135,270 | 1,229,351 | 921,451 | 49,579,704 |
| 1952 | 12,111,048 | 108,028 | 12,219,076 | 29,853,765 | 4,892,431 | 1,285,031 | 48,250,303 |
| 1953 | 14,842,978 | 70,874 | 14,913,852 | 45,425,834 | 9,550,681 | 1,273,216 | 71,163,583 |
| 1954 | 21,025,232 | 60,442 | 21,085,673 | 25,031,547 | 24,058,300 | 1,102,141 | 71,277,661 |
| 1955 | 17,414,790 | 8,414 | 17,423,204 | 13,496,224 | 19,888,416 | 183,864 | 50,991,708 |
| 1956 | 25,029,870 | 182,725 | 25,212,595 | 33,408,915 | 3,003,680 | 245,662 | 61,870,852 |
| 1957 | 31,109,649 | 153,758 | 31,263,407 | 44,603,972 | 2,391,280 | 744,591 | 79,003,250 |
| 1958 | 24,453,830 | 39,900 | 24,493,730 | 26,598,894 | 2,713,574 | 522,707 | 54,328,905 |
| 1959 | 11,741,551 | 3,000 | 11,744,551 | 24,773,647 | 205,451 | 926,689 | 37,650,338 |
| 1960 | 7,530,199 | – | 7,530,199 | 15,976,326 | 44,512 | 618,119 | 24,169,156 |
| 1961 | 256,659 | – | 256,659 | 16,826,784 | 19,911 | 618,626 | 17,721,980 |

Office of Vice-President and Comptroller,
Statistics Section,
Montreal, August 9, 1962.

## APPENDIX 2

### Rolling Stock Inventory – 1948–1961

| Year | Locomotives | | | Freight Train Cars | | | | | Passenger Train Cars | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steam | Diesel | Electric | Box, Auto & Stock | Refrigerators, Tanks & Cov. Hop. | Gondolas, Ore & Open Hopper | Flat | Conductors' Vans | Rail Diesel | Coach | Sleeping, Dining & Parlour | Baggage, Mail & Express | Work Cars |
| 1948 | 1,747 | 84 | 7 | 57,650 | 4,238 | 8,688 | 4,341 | 1,264 | – | 1,208 | 628 | 872 | 5,854 |
| 1949 | 1,722 | 132 | 10 | 58,352 | 4,524 | 9,787 | 4,496 | 1,375 | | 1,213 | 632 | 885 | 5,849 |
| 1950 | 1,690 | 190 | 10 | 57,141 | 4,725 | 9,742 | 4,425 | 1,359 | | 1,256 | 640 | 926 | 5,941 |
| 1951 | 1,664 | 232 | 10 | 58,393 | 4,975 | 9,934 | 4,383 | 1,348 | | 1,251 | 639 | 922 | 6,124 |
| 1952 | 1,622 | 292 | 10 | 58,957 | 4,964 | 10,417 | 4,435 | 1,339 | | 1,214 | 638 | 969 | 6,086 |
| 1953 | 1,594 | 365 | 10 | 57,853 | 5,934 | 11,687 | 4,451 | 1,381 | 4 | 1,203 | 634 | 1,041 | 6,323 |
| 1954 | 1,522 | 459 | 10 | 56,519 | 6,132 | 12,475 | 4,579 | 1,419 | 7 | 1,153 | 691 | 1,062 | 6,548 |
| 1955 | 1,404 | 556 | 10 | 54,647 | 6,131 | 12,801 | 4,698 | 1,400 | 16 | 1,100 | 710 | 1,056 | 6,431 |
| 1956 | 1,205 | 668 | 10 | 54,860 | 6,173 | 13,391 | 4,447 | 1,375 | 31 | 900 | 658 | 1,046 | 6,277 |
| 1957 | 972 | 822 | 10 | 55,767 | 6,268 | 14,463 | 4,424 | 1,356 | 43 | 711 | 611 | 974 | 6,146 |
| 1958 | 776 | 944 | 10 | 54,289 | 6,335 | 15,406 | 4,515 | 1,329 | 55 | 612 | 584 | 891 | 6,205 |
| 1959 | 553 | 1,009 | 10 | 54,015 | 6,356 | 15,359 | 4,625 | 1,291 | 54 | 531 | 550 | 787 | 6,077 |
| 1960 | 364 | 1,054 | 10 | 53,634 | 6,117 | 15,277 | 5,105 | 1,225 | 54 | 491 | 497 | 692 | 5,922 |
| 1961 | 188 | 1,054 | 10 | 53,904 | 5,274 | 15,184 | 5,005 | 1,169 | 54 | 464 | 455 | 643 | 5,754 |

Office of Vice-President and Comptroller,
Statistics Section,
Montreal, August 9, 1962.

## APPENDIX 3

### Units of New Rolling Stock

| Year | Locomotives | | Freight Cars | | | | | | | | | | Passenger Cars | | Work Equipment | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steam | Diesel | Automobile | Box | Flat | Gondola | Hopper | Ore | Refrigerator | Stock | Tank | Van | Rail Diesel | Other | | |
| 1947 | 6 | 13 | 500 | 2,672 | – | – | 251 | – | 55 | – | – | 50 | – | 17 | 134 | 3,698 |
| 1948 | 52 | 29 | 120 | 1,138 | – | 850 | 450 | – | 500 | – | – | 41 | – | 53 | 8 | 3,241 |
| 1949 | 6 | 48 | – | 1,717 | 200 | 650 | 550 | – | 350 | – | – | 129 | – | 50 | 4 | 3,704 |
| 1950 | – | 58 | – | 1,500 | – | – | 50 | 100 | 200 | – | 20 | – | – | 114 | 37 | 2,079 |
| 1951 | – | 42 | 350 | 3,974 | – | 300 | 50 | – | 350 | – | – | – | – | – | 20 | 5,086 |
| 1952 | – | 60 | – | 3,502 | 106 | 300 | 229 | – | – | – | – | 1 | – | 50 | 44 | 4,292 |
| 1953 | – | 73 | 300 | 2,060 | 100 | 500 | 1,196 | 50 | 550 | – | 65 | 50 | 4 | 130 | 5 | 5,083 |
| 1954 | – | 94 | – | 1,500 | 200 | 500 | 350 | – | 200 | – | 40 | 50 | 3 | 120 | 5 | 3,062 |
| 1955 | – | 97 | – | 1,000 | 200 | 200 | 240 | – | – | – | – | – | 9 | 83 | 1 | 1,830 |
| 1956 | – | 113 | – | 3,200 | – | 200 | 450 | 100 | 2 | – | – | – | 15 | – | 7 | 4,087 |
| 1957 | – | 154 | 600 | 2,325 | 100 | 550 | 650 | 100 | – | – | – | – | 12 | – | 2 | 4,493 |
| 1958 | – | 122 | – | 1,000 | 300 | 550 | 600 | – | – | 200 | – | – | 12 | – | 1 | 2,785 |
| 1959 | – | 65 | 500 | 1,000 | 300 | – | 155 | – | – | – | – | – | – | 8 | 16 | 2,044 |
| 1960 | – | 45 | – | 1,000 | 590 | – | – | – | – | – | – | – | – | – | 2 | 1,637 |
| 1961 | – | – | – | 1,450 | 10 | 1 | 100 | – | – | – | – | – | – | – | 2 | 1,563 |

Note: Excludes conversions between classes.

Office of Vice-President and Comptroller,
Statistics Section,
Montreal, August 9, 1962.

## APPENDIX 4

### Change in the Economy and Volume of Transportation Produced (In Millions)

| Year | Gross National Product | | | Cndn. Inter-City Rev. Ton Miles-Total | Index | Inter-City Rev. Ton Miles All Cndn. Rys | Can. Pac. & Can. Nat. | | |
|---|---|---|---|---|---|---|---|---|---|
| | (Current $) | (Constant 1949 $) | Index | | | | Index | Ton Miles Rev. Frt. | Index |
| 1947 | 13,165 | 15,446 | 100.0 | 82,520 | 100.0 | 60,143 | 100.0 | 59,147 | 100.0 |
| 1948 | 15,120 | 15,735 | 101.9 | 84,062 | 101.9 | 59,080 | 98.2 | 58,161 | 98.3 |
| 1949 | 16,343 | 16,343 | 105.8 | 82,735 | 100.3 | 56,338 | 93.7 | 55,182 | 93.3 |
| 1950 | 18,006 | 17,471 | 113.1 | 87,673 | 106.2 | 55,538 | 92.3 | 54,929 | 92.9 |
| 1951 | 21,170 | 18,547 | 120.1 | 100,725 | 122.1 | 64,300 | 106.9 | 63,262 | 107.0 |
| 1952 | 23,995 | 20,027 | 129.7 | 108,456 | 131.4 | 68,430 | 113.8 | 67,373 | 113.9 |
| 1953 | 25,020 | 20,794 | 134.6 | 110,059 | 133.4 | 65,267 | 108.5 | 64,134 | 108.4 |
| 1954 | 24,871 | 20,186 | 130.7 | 102,099 | 123.7 | 57,547 | 95.7 | 56,550 | 95.6 |
| 1955 | 27,132 | 21,920 | 141.9 | 118,665 | 143.8 | 66,176 | 110.0 | 61,400 | 103.8 |
| 1956 | 30,585 | 23,811 | 154.2 | 141,208 | 171.1 | 78,820 | 131.1 | 72,369 | 122.4 |
| 1957 | 31,909 | 24,117 | 156.1 | 132,205 | 160.2 | 71,047 | 118.1 | 63,955 | 108.1 |
| 1958 | 32,894 | 24,397 | 158.0 | 126,630 | 153.5 | 66,357 | 110.3 | 61,950 | 104.7 |
| 1959 | 34,784 | 25,157 | 162.9 | 133,646 | 162.0 | 67,957 | 113.0 | 61,495 | 104.0 |
| 1960 | 35,928 | 25,617 | 165.8 | 128,658 | 155.9 | 65,445 | 108.8 | 59,744 | 101.0 |
| 1961 | 36,844 | 26,097 | 169.0 | | | | | 61,174 | 103.4 |

Source: G.N.P., Canadian Statistical Review; Canadian Inter-City Ton Miles, Railway Association of Canada from D.B.S. figures; C.P. and C.A. Annual Reports.

This table appears as Exhibit No. 1 in the Statement of Evidence given by Mr. R.A .Emerson to the "Board of Conciliation and Investigation Considering the Matters in Dispute arising out of the Requests Served on Dec. 20, 1961, by the Non-Operating Railway Employees".

## APPENDIX 5

### Canadian Inter-city Revenue Ton Miles by Type of Carrier
(In Millions)

| Year | Rail | | Roads* | | Water ** | | Air @ | | Oil Pipe Lines @@ | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ton Miles | % of Total | Ton Miles | % of Total | Ton Miles | % of Total | Ton Miles | % of Total | Ton Miles | % of Total | Ton Miles | Per-centage |
| 1948 | 59,080 | 70.3 | 5,193 | 6.2 | 19,782 | 23.5 | 7 | ¢ | — | — | 84,062 | 100.0 |
| 1949 | 56,338 | 68.1 | 5,920 | 7.2 | 20,469 | 24.7 | 8 | ¢ | — | — | 82,735 | 100.0 |
| 1950 | 55,538 | 63.3 | 7,597 | 8.7 | 23,032 | 26.3 | 10 | ¢ | 1,496 | 1.7 | 87,673 | 100.0 |
| 1951 | 64,300 | 63.8 | 8,238 | 8.2 | 24,625 | 24.5 | 11 | ¢ | 3,551 | 3.5 | 100,725 | 100.0 |
| 1952 | 68,430 | 63.1 | 8,903 | 8.2 | 26,313 | 24.3 | 17 | ¢ | 4,793 | 4.4 | 108,456 | 100.0 |
| 1953 | 65,267 | 59.3 | 9,778 | 8.9 | 28,001 | 25.4 | 21 | ¢ | 6,992 | 6.4 | 110,059 | 100.0 |
| 1954 | 57,547 | 56.4 | 10,012 | 9.8 | 25,250 | 24.7 | 20 | ¢ | 9,270 | 9.1 | 102,099 | 100.0 |
| 1955 | 66,176 | 55.8 | 10,248 | 8.6 | 29,282 | 24.7 | 31 | ¢ | 12,928 | 10.9 | 118,665 | 100.0 |
| 1956 | 78,820 | 55.8 | 10,614 | 7.5 | 33,594 | 23.8 | 39 | ¢ | 18,141 | 12.9 | 141,208 | 100.0 |
| 1957 | 71,047 | 53.8 | 10,679 | 8.1 | 31,251 | 23.6 | 38 | ¢ | 19,190 | 14.5 | 132,205 | 100.0 |
| 1958 | 66,357 | 52.4 | 14,080 | 11.1 | 29,207 | 23.1 | 35 | ¢ | 16,951 | 13.4 | 126,630 | 100.0 |
| 1959 | 67,957 | 50.8 | 14,397 | 10.8 | 33,810 | 25.3 | 38 | ¢ | 17,444 | 13.1 | 133,646 | 100.0 |
| 1960 | 65,445 | 50.9 | 13,841 | 10.8 | 31,427 | 24.4 | 43 | ¢ | 17,902 | 13.9 | 128,658 | 100.0 |

* – Prior to 1957 estimated by using the trend of Canadian registrations, U.S. Bureau of Public Roads average load and average miles travelled with 1957 Motor Transport Traffic Statistics as the base.

** – Estimated by using cargo data in "Shipping Statistics" together with assumed average distances for major water lanes. The ton mile figures were then adjusted according to the fluctations of canal traffic in previous years.

@ – Includes an estimated for bulk transportation ton miles.

@@ – Includes trunk and gathering lines.

¢ – Less than one-tenth of 1%.

Source: Dominion Bureau of Statistics. Op. cit. Exhibit No. II.

## APPENDIX 6

### Canadian Inter-city Passenger Miles by Type of Carrier
### (Millions of Passenger Miles)

| Year | Rail★ | | Air★★ | | Bus@ | | Total Public Carrier | | Private Automobile@ | Grand Total Miles |
|---|---|---|---|---|---|---|---|---|---|---|
| | Miles | % | Miles | % | Miles | % | Miles | % | Miles | |
| 1948 | 3,477 | 47.5 | 385 | 5.2 | 3,463 | 47.3 | 7,325 | 100.0 | 11,719 | 19,044 |
| 1949 | 3,193 | 43.1 | 465 | 6.3 | 3,743 | 50.6 | 7,401 | 100.0 | 15,686 | 23,087 |
| 1950 | 2,816 | 41.1 | 551 | 8.1 | 3,478 | 50.8 | 6,845 | 100.0 | 17,306 | 24,151 |
| 1951 | 3,110 | 43.1 | 680 | 9.4 | 3,433 | 47.5 | 7,223 | 100.0 | 20,443 | 27,666 |
| 1952 | 3,151 | 45.8 | 806 | 11.7 | 2,922 | 42.5 | 6,879 | 100.0 | 23,595 | 30,474 |
| 1953 | 2,986 | 44.9 | 942 | 14.1 | 2,727 | 41.0 | 6,655 | 100.0 | 26,038 | 32,693 |
| 1954 | 2,863 | 44.8 | 1,067 | 16.7 | 2,456 | 38.5 | 6,386 | 100.0 | 27,664 | 34,050 |
| 1955 | 2,892 | 44.8 | 1,224 | 19.0 | 2,337 | 36.2 | 6,453 | 100.0 | 29,968 | 36,421 |
| 1956 | 2,908 | 44.1 | 1,547 | 23.5 | 2,134 | 32.4 | 6,589 | 100.0 | 33,000 | 39,589 |
| 1957 | 2,925 | 44.1 | 1,835 | 27.6 | 1,880 | 28.3 | 6,640 | 100.0 | 35,070 | 41,710 |
| 1958 | 2,486 | 38.3 | 2,142 | 33.0 | 1,865 | 28.7 | 6,493 | 100.0 | 36,980 | 43,473 |
| 1959 | 2,446 | 35.5 | 2,496 | 36.3 | 1,943 | 28.2 | 6,885 | 100.0 | 40,171 | 47,056 |
| 1960 | 2,264 | 31.9 | 2,847 | 40.1 | 1,984 | 28.0 | 7,095 | 100.0 | 42,380 | 49,475 |

★ — Includes Commuter Service.

★★ — Includes Canadian portion of International Operations of both Foreign and Canadian Carriers.

@ — Estimated January 25, 1960.

Source: Dominion Bureau of Statistics. Op. cit. Exhibit No. III.

APPENDIX 7

Cyclicality of Employment of Occupational Groups at Angus Workshops

| | Pre 1952 Low | 1952 High | 1950 & 1952 | | Post 1952 Low | 1952 & 1954 | | Post 1954 High | 1954 & 1956 | | Post 1956 Low | 1956 & 1961 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd Qtr. 1950 Total | 3rd Qtr. 1952 Total | 3rd Qtr. 50 Δ 3rd Qtr. 52 | % Δ 1950 1952 | 3rd Qtr. 1954 Total | 3rd Qtr. 52 Δ 3rd Qtr. 54 | % Δ 1952 1954 | 3rd Qtr. 1956 Total | 3rd Qtr. 54 Δ 3rd Qtr. 56 | % Δ 1954 1956 | 3rd Qtr. 1961 Total | 3rd Qtr. 56 Δ 3rd Qtr. 61 | % Δ 1956 1961 |
| Chargehands | 61 | 64 | + 3 | 4.9 | 52 | - 12 | 18.8 | 48 | - 4 | - 7.7 | 37 | - 11 | 22.9 |
| Markers-off | 12 | 13 | + 1 | 8.3 | 11 | - 2 | 15.4 | 11 | 0 | 0 | 5 | - 6 | 54.5 |
| Machinists – brass | 65 | 78 | + 13 | 20.0 | 53 | - 25 | 32.0 | 75 | + 22 | 41.5 | 17 | - 58 | 77.3 |
| – metal | 634 | 719 | + 85 | 13.4 | 447 | -272 | 37.8 | 559 | +112 | 25.1 | 397 | -162 | 29.0 |
| – wood | 59 | 89 | + 20 | 29.0 | 67 | - 22 | 24.7 | 70 | + 3 | 4.5 | 6 | - 64 | 91.4 |
| Forgemen | 12 | 17 | + 5 | 41.7 | 7 | - 10 | 58.8 | 9 | + 2 | 28.6 | 2 | - 7 | 77.8 |
| Hammersmiths | 4 | 7 | + 3 | 75.0 | 3 | - 4 | 57.1 | 3 | 0 | 0 | 1 | - 2 | 66.7 |
| Blacksmiths | 44 | 49 | + 5 | 11.4 | 33 | - 16 | 32.7 | 47 | + 14 | 42.4 | 24 | - 23 | 48.9 |
| Boilermakers | 147 | 151 | + 4 | 2.7 | 77 | - 74 | 49.0 | 103 | + 26 | 33.8 | 29 | - 74 | 71.8 |
| Flangers | 1 | 1 | 0 | 0 | 1 | - 0 | 0 | – | - 1 | -100.0 | | – | 0 |
| Pipe S-Fitters | 138 | 193 | + 55 | 39.9 | 125 | - 68 | 35.2 | 151 | + 26 | 20.8 | 92 | - 59 | 39.1 |
| Sheet-metal Workers | 188 | 247 | + 59 | 31.4 | 159 | - 88 | 35.6 | 190 | + 31 | 19.5 | 86 | - 104 | 54.7 |
| Electricians | 88 | 121 | + 33 | 37.5 | 88 | - 33 | 27.3 | 142 | + 54 | 61.4 | 108 | - 34 | 23.9 |
| Moulders | 32 | 33 | + 1 | 3.1 | 28 | - 5 | 15.2 | 31 | + 3 | 10.7 | 3 | - 28 | 90.4 |
| Pattern Makers | 6 | 7 | + 1 | 16.7 | 4 | - 3 | 42.9 | 5 | + 1 | 25.0 | 4 | - 1 | 20.0 |
| Frog Switch Fitters | 27 | 35 | + 8 | 29.6 | 32 | - 3 | 8.6 | 26 | - 6 | - 18.8 | 18 | - 8 | 30.8 |
| Carpenters-Coach | 339 | 469 | +130 | 38.3 | 160 | -309 | 65.9 | 186 | + 26 | 16.3 | 92 | - 94 | 50.5 |
| Freight | 555 | 871 | +316 | 56.9 | 605 | -266 | 30.5 | 778 | + 173 | 28.6 | 409 | -369 | 47.4 |
| Trimmers | 56 | 72 | + 16 | 28.6 | 51 | - 21 | 29.2 | 41 | - 10 | - 19.6 | 15 | - 26 | 63.4 |
| Strippers | 17 | 22 | + 5 | 29.4 | 16 | - 6 | 27.3 | 16 | 0 | 0 | 2 | - 14 | 87.5 |
| Painters | 213 | 303 | + 90 | 42.3 | 186 | -117 | 38.6 | 189 | + 3 | 1.6 | 102 | - 87 | 46.0 |
| Cabinet Makers | 44 | 87 | + 43 | 97.7 | 35 | - 52 | 59.8 | 38 | + 3 | 8.6 | 11 | - 27 | 71.1 |
| Oxidizers | 7 | 8 | + 1 | 14.3 | 7 | - 1 | 12.5 | 7 | 0 | 0 | 5 | - 2 | 28.6 |
| Brass Buffers | 11 | 12 | + 1 | 9.1 | 8 | - 4 | 33.3 | 9 | + 1 | 12.5 | 6 | - 3 | 33.3 |

| | Pre 1952 Low | 1952 High | 1950 & 1952 | | Post 1952 Low | 1952 & 1954 | | Post 1954 High | 1954 – 1956 | | Post 1956 Low | 1956 & 1961 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd Qtr. 1950 Total | 3rd Qtr. 1952 Total | 3rd Qtr. 50 Δ 3rd Qtr. 52 | % Δ 1950 1952 | 3rd Qtr. 1954 Total | 3rd Qtr. 52 Δ 3rd Qtr. 54 | % Δ 1952 1954 | 3rd Qtr. 1956 Total | 3rd Qtr. 54 Δ 3rd Qtr. 56 | % Δ 1954 1956 | 3rd Qtr. 1961 Total | 3rd Qtr. 56 Δ 3rd Qtr. 61 | % Δ 1956 1961 |
| Varnishers | – | – | 0 | 0 | – | – | 0 | – | – | | – | – | |
| Colour Mixers | 1 | 1 | 0 | 0 | 1 | 0 | 0 | – | - 1 | - 100.0 | – | – | |
| Stencil Cutters | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | | 2 | + 1 | 100.0 |
| Upholsterers | 47 | 50 | + 3 | 6.4 | 30 | - 20 | 40.0 | 17 | - 13 | - 43.3 | 31 | + 14 | 82.4 |
| Seamstresses | 7 | 5 | - 2 | | 3 | - 2 | 40.0 | 4 | + 1 | 33.3 | 4 | 0 | 0 |
| Carmen | 13 | 29 | + 16 | 123.1 | 23 | - 6 | 20.7 | 30 | + 7 | 30.4 | 6 | - 24 | 80.0 |
| Cranemen | 50 | 59 | + 9 | 18.0 | 41 | - 18 | 30.5 | 47 | + 6 | 14.6 | 29 | - 18 | 38.3 |
| Transfer Table Operators | 2 | 2 | 0 | 0 | 1 | - 1 | 50.0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Welders | 64 | 161 | + 97 | 151.6 | 95 | - 66 | 41.0 | 130 | + 38 | 36.8 | 58 | - 72 | 55.4 |
| Yardmen | 21 | 21 | 0 | 0 | 21 | 0 | 0 | 21 | 0 | 0 | 17 | - 4 | 19.0 |
| Engineers | 7 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 |
| Firemen | 21 | 24 | + 3 | 14.3 | 18 | - 6 | 25.0 | 24 | + 6 | 33.3 | 16 | - 8 | 33.3 |
| Apprentices | 248 | 335 | + 87 | 35.1 | 222 | - 113 | 33.7 | 175 | - 47 | - 21.2 | 109 | - 66 | 37.7 |
| Boys | 11 | 12 | + 1 | 9.1 | 9 | - 3 | 25.0 | 8 | - 1 | - 11.1 | 5 | - 3 | 37.5 |
| Helpers | 1,344 | 1,866 | + 522 | 38.8 | 1,105 | - 761 | 40.8 | 1,392 | +287 | 26.0 | 652 | - 740 | 53.2 |
| Labourers | 792 | 920 | + 128 | 16.2 | 665 | - 225 | 27.7 | 771 | +106 | 15.9 | 497 | - 274 | 35.5 |
| Miscellaneous | 389 | 524 | + 135 | 34.7 | 360 | - 164 | 31.3 | 480 | +120 | 33.3 | 258 | - 222 | 46.3 |
| General Foremen | 7 | 8 | + 1 | 14.3 | 7 | - 1 | 12.5 | 6 | - 1 | - 14.3 | 5 | - 1 | 16.7 |
| Foremen | 34 | 41 | + 7 | 20.6 | 38 | 3 | 7.3 | 38 | 0 | 0 | 32 | - 6 | 15.8 |
| Asst. Foremen | 73 | 152 | + 79 | 29.0 | 112 | - 40 | 27.2 | 112 | 0 | 0.8 | 86 | - 26 | 23.2 |
| Contract Foremen | 58 | 17 | - 41 | | 11 | - 6 | | 10 | - 1 | | 8 | - 2 | 20.0 |
| Clerks – Works mgr. | 53 | 48 | - 5 | – | 44 | - 4 | 8.3 | 42 | - 2 | - 4.5 | 45 | + 3 | 7.1 |
| Shop – Yard | 52 | 55 | + 3 | 5.8 | 51 | - 4 | 7.3 | 52 | + 1 | 2.0 | 49 | - 3 | 5.8 |
| Miscellaneous | 67 | 75 | + 8 | 11.9 | 74 | - 1 | 1.3 | 72 | - 2 | - 2.7 | 55 | - 17 | 23.6 |
| | 6,132 | 8,081 | +1,949 | + 31.8 | 5,194 | -2,887 | -35.7 | 6,174 | +980 | + 18.8 | 3,443 | -2,731 | 44.2 |

## APPENDIX 8

### The Mechanization of the Angus Lumber Yard

When the mechanization of the Angus Lumber Yard was first proposed all handling of lumber at Angus was done manually. The proposals for mechanization consisted of a scheme to mechanize most of the handling by purchasing a lift truck and two powered transfer tables with winches. In addition, a storage area and roadways (2,515 square yards) were to be paved and four snow pits provided.

### Operation Prior to Mechanization

Stores Department

Lumber received from suppliers was unloaded manually from box cars either onto track dollies at the kiln or, if this area was full, the lumber was unloaded manually and stacked in the yard.

Mechanical Department

The following operations were performed manually:

a) loading lumber into box cars in the yard and unloading it at the kiln;

b) pushing track dollies of lumber into the kiln;

c) pushing track dollies of lumber out of the kiln onto the transfer table and then, by means of a stationary hoist, transferring the lumber onto other dollies which were pushed to the door at the north side of the mill;

d) pushing track dollies of lumber from the kiln to storage tracks at the east end of the mill;

e) pushing track dollies of lumber from the kiln to the hardwood shed;

f) distributing lumber within the mill.

### Operation After Mechanization

Stores Department

Lumber is received in strapped unit loads on flat cars and is unloaded by a forklift truck. The bundles are then stickered on the ground after which they are transferred to the truck dollies on the unloading track by the lift truck. If these tracks are full, the bundles of lumber are piled by the lift truck in the available storage area on or adjacent to the paved area.

The Stores Department has taken over the operations of loading and emptying the kiln and the movement of lumber from the kiln to the east door of the mill. Kiln loading and emptying operations are done by means of the winches on the powered transfer tables, and the lumber is moved by the lift truck from the transfer table on the south side of the kiln to the north door of the mill.

Mechanical Department

Items b) and c), outlined under the previous operation in the Mechanical Department, have been taken over by the Stores Department.

The amount of manual work under Item a) has decreased to a small percentage of the previous amount because most of the lumber is now handled by the lift truck.

The Mechanical Department continues to perform the duties under Items d), e) and f).

The mechanization process resulted in the reduction of employment in the Stores Department operation from 6 to 3 persons. In the Mechanical Department, employment was reduced from 22 to 12 labourers at an annual saving at that time of $31,188.

## APPENDIX 9

### Changes to Diesel-Electric Units to Reduce Maintenance and/or Improve Performance

Note: Since this is a general listing of changes affecting many types of units, it must be understood that all changes shown need not necessarily have been applied to any one type.

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| 1. Winterization.<br>As manufactured. | Blocking additional carbody air filters in winter, redirection of air flow patterns and application of return air ducts. | Exclusion of snow and moisture from electrical machinery and control cabinets, reduction of ground relay operation, warmer enginerooms, warmer operating cabs with improved draft conditions. |
| 2. Cold Weather Idling and Shutdown Protection.<br>Engines idled only. | Automatic engine start-stop arrangement. | Protection of engines against freezing. Reduction in fuel oil costs. Elimination of engine watchman. |
| | Standby supplementary heaters. | Protection of engines against freezing. Reduction in fuel oil costs. Reduction in engine parts wear. Elimination of engine watchman. |
| 3. Cab Heaters.<br>Insufficient & inefficient. | Additional and higher-capacity heaters applied. Draft elimination program undertaken. | Warmer and more draft-free operating cabs, more comfortable and efficient crews. |
| 4. Engine Air Filters.<br>Cleaned at builders' recommended intervals. | Different types studied. Cleaning intervals extended on basis of lubricating oil analyses. | Reduction in maintenance costs commensurate with satisfactory engine conditions. |

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| 5. Electrical Machinery Protection. Carbody air filtration only. | Generator air intake ducts and bulkheads between engine and generator compartments. | Cleaner generators, fewer electrical grounds, reduction in maintenance expense. |
| 6. Engine Lubricating Oil. | Modified by detergents and other additives. | Improved reliability, extended intervals between oil changes and major engine inspections. |
| 7. Turbosupercharger. As manufactured for 4-cycle engines | Completely new models and numerous design changes. | Improved performance and reliability. |
| 8. Crankshaft. As manufactured for 4-cycle engines. | Manufacturer design changes. Reclamation by chrome plating. | Improved operation. Reduction in maintenance costs. Extension of major overhaul intervals. |
| 9. Engine Parts Reclamation. None available. | Manufacturer-designed and railway-designed reclamation methods. | Lower repair costs, fewer new replacement parts. |
| 10. Engine Parts Improvements. | Adopted on basis of availability — items such as injectors, valves, water seals and gaskets. | Improved performance and reliability. Lower repair costs. |
| 11. Emergency Fuel Shutoff Valve. Exposed to wind pipe. | Relocated or enclosed. | Improved performance. Elimination of train delays due to blocking of fuel lines at valve. |

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| 12. Belt-Driven Auxiliaries<br>Numerous and high maintenance items. | Belt drives virtually eliminated, designs of remainder improved. | Lower maintenance costs. Also eliminated necessity for helper to patrol engine-rooms to check belt condition. Fewer overheated traction motors. |
| 13. Cooling Fan Drive and Control<br>Manually-operated clutch. | Electrical or air-operated clutches automatically-controlled. | Elimination of human factor in manual control. Reduction of clutch and engine damage. Operation at optimum engine temperatures. |
| 14. Spark Arrestors.<br>None or poorly-designed. | Centrifugal-type arrestors, wire netting or baffled mufflers as required. | Reduction of number of fires on or adjacent to right-of-way. |
| 15. Electrical Rotating Equipment Bearings.<br>Oil-lubricated. | Grease-lubricated and sealed grease-lubricated bearings adopted. | Reduction of bearing failures, lower maintenance and repair costs, extended overhaul intervals. |
| 16. Electrical Equipment Insulation Systems.<br>Manufacturers' standards. | Improved materials with higher endurance and temperature rating figures adopted as they became available. | Greater reliability; longer life; improved resistance to oil, water and other contaminants. Extended overhaul intervals. |
| 17. Wire & Cable Insulation.<br>Rubber or varnished cotton braid. | Rubber-insulated, neoprene-jacketed. | Fewer electrical grounds and short circuits. Lower maintenance costs. Longer life. |

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| 18. Flashover Damage. | | |
| Frequent experience on original units. | More reliable detection and protection circuits. | Damage limited. |
| | Polyester-glass armature bands. | Damage limited. |
| | Closer control of maintenance requirements. | Reduction in rate of incidence. |
| 19. Electrical Controls and Circuits. | | |
| Adapted from industrial applications. | Improved for motive power applications. | Greater reliability and lower maintenance costs. |
| Optimum inspection intervals not established. | Inspection intervals established. | Improved reliability, lower maintenance costs. |
| 20. Transition Control. | | |
| Manual. | Automatic control added. | Improved train performance. Better use of available horsepower throughout speed range of unit. Frees engineman to attend to other duties. Lower repair costs. |
| 21. Dynamic Brake Control. | | |
| Manual. | Automatic control installed. | Improved train performance. Frees engineman to attend to other duties. Frees helper of need to inspect grids for signs of overheating. Lower damage repair costs. |
| Limited effective speed range. | Extended effective speed range. | Improved train handling characteristics. |
| Field-loop or voltage excitation control. | Field-loop and voltage control (Universal DB). | Greater flexibility of locomotive consists of different manufacturers' types. |
| 22. Wheelslip Control. | | |
| Manual plus manual sanding control. | Automatic controls installed. | Improved train performance. Reduction of stalling on ruling grades with tonnage trains. Frees engineman to attend to other duties. |
| | Increased sensitivity and range, automatic controls. | Further improvement in train performance and reduction in maintenance costs. |

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| 23. Radiator Shutter Control. Manual by engineman's helper. | Automatic controls applied. | Improved control of engine temperatures. Frees helper of necessity to patrol engine-rooms and operate shutters manually. Reduced maintenance costs. |
| 24. Voltage Regulator. Could not withstand vibration. | Improved electromechanical type applied. | More reliable performance, reduced maintenance, less battery damage, fewer delays. |
| | Transistorized electronic type available or applied. | No moving parts; virtually maintenance-free. |
| 25. Relays & Contractors Designed for stationary industrial applications. | Designs improved or new designs produced for railway use. | Greater reliability, fewer failures in service, fewer train delays, less maintenance. |
| 26. Traction Motor Cut-Out. None provided. | Applications made to nearly all units. | Permits cutting out single traction motor, pair of motors or a truck to enable movement of a partially-disabled unit under its own power to a repair point. Minimizes train delay time. |
| 27. Air Compressor Synchronization. Not provided. Manual control by engineman's helper. | Automatic electrical train-line synchronization applied to all units with MU control. | Distributes load among all compressors in a consist preventing anyone from overworking. Eliminates necessity for engineman's helper to patrol units and cut out overheated compressors. Reduces repair and maintenance costs. |

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| 28. Headlight.<br>Steam locomotive designs adapted. | Dual sealed-beam types adopted and indicator lights applied. | Improved illumination for operating crews. Indicators to warn of headlamp and classification lamp failure. |
| 29. Radio.<br>Not provided. | Provided for yard-switching units in specific locations and for end-to-end road communications--also for yardmasters and dispatchers. | Improved efficiency in switching operations. More effective communication in road service. Minimization of train delay times. |
| 30. Electrical Circuit Protection.<br>Fuses. | Circuit breakers adopted to replace fuse applications. | Elimination of necessity to test fuses in trouble-shooting procedures. Breaker gives indication of circuit in difficulty. |
| 31. Electrical Circuit Arrangement.<br>Complicated. | Circuits simplified and redundant parts eliminated. | Simplified maintenance and trouble-shooting. Reduced maintenance expense. |
| 32. Air Brake Piping.<br>Exposed to cold and wind wipe. | Piping relocated, rearranged or otherwise protected.<br><br>Improved intercoolers & aftercoolers. | Elimination of train delays due to frozen condensate in air piping. Reduction in maintenance expense.<br>Minimization of condensate in piping. |
| 33. Air Compressor.<br>Air-coolers. | Improved-design air-cooled or water-cooled applied. | Reduction in oil carryover into air brake system. Reduction in maintenance expense. Reduction in incidences of compressor overheating. |

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| 34. Brake-Pipe Pressure Maintaining. Not available. | Applied to some units as a modification and to later units when they were built. | Permits application of correct amount of braking to control a train and relieves engineman of necessity of constantly monitoring amount of braking. Improved train operation. |
| 35. Safety Control. Available but not used. | Applied when required, modernized and used on all units. | Provides for automatic removal of power from traction motors and application of brakes in the event that an engineman becomes incapacitated. |
| 36. Steam Generator. Subject to frequent breakdown. | Mechanical, electrical and material improvements added. | More reliable performance. Reduction of delays to passenger trains. |
| 37. Horsepower. 1000-1500 H.P. Units. | Usual ratings now 1800-2400 horsepower and higher ratings available or under development. | Increased hauling capacity per unit. Reduction in overall number of units required to haul any given amount of freight. Higher operating speeds permissible with same tonnage as before. |
| 38. Fuel Capacity. 600-1000 Imp. gallons. | Increased 50% or more. | Increased operating range. Greater flexibility of operations. |
| 39. Traction Motor Support. Spring pack. | Rubber-steel "sandwich". | Reduction of vibrations and shock loads transmitted to motors. Reduction of motor wear and damage. Reduced repair and |

| Feature & Its Original State | Alteration or Addition | Effect of Change |
|---|---|---|
| | | maintenance costs. Assists in control of certain types of wheelslip. |
| 40. Motor Support Bearings.<br>Wool waste pack lubricated. | Felt-wick lubricators adopted. | Elimination of waste grabs and improved unit performance. |
| | Narrow-window bearing liners. | Extended life, reduced maintenance costs. |
| 41. Pilot.<br>Manufacturers' types designed for U.S.A. conditions. | Modified and redesigned for Canadian conditions. | Greater strength when rock and snow slides and snow-drifts encountered. Improved safety feature for operating crews and train protection. |
| 42. Bell & Ringer.<br>Audibility reduced due to location. Ringer motors froze due to condensate and wind pipe. | Bell & Ringers relocated. | Improved audibility. Reduction in number of frozen ringers experienced. |
| | Internal design changes. | Improved reliability. Lower maintenance costs. |
| 43. Whistle.<br>Air-operated, single tone inadequate as warning device. | Air-operated, three-tone style tested and adopted as standard. | Louder, more distinctive warning given. |
| 44. Service Facilities.<br>Partly-converted steam locomotive shops unsuitable for diesel service, maintenance and overhaul. | New diesel shops and service platforms built. Two backshops remodelled for diesel overhaul. | Increased service and maintenance efficiency. Decreased service and overhaul times and reduction in maintenance expenses. |

Canadian Pacific Railway Company,
Office of the Chief of M.P. & R.S.,
Montreal,
6 September 1962.

APPENDIX 10

Changes to Rolling Stock to Reduce the Number of Man-Hours Needed for Maintenance

| Previous Method | New Method | Estimated Increased Life Expectancy or Reduction in Maintenance Time |
|---|---|---|
| Cast iron wheels | Steel wheels | Life expectancy increased 2½ to 3 times |
| Waste packed journal boxes | Lubricator pads | 50% time reduction in replacements |
| Plywood dust guards | Fibre dust guards | |
| Solid journal bearings | Roller journal bearings | 90% time reduction in overall servicing |
| Tongue and groove lining in refrigerator cars | Plywood | |
| Hanger type brake beams | Unit hangerless type | |
| Cast iron brake shoes | Composition | Life expectancy increased 6 times |
| Arch bar trucks | Cast steel | |
| Two stringers and 1¾ in. floor in box cars | Three stringers and 2¼ in. floor | 50% time reduction in floor replacement |
| Roof painted on house cars when purchased new | Unpainted | 15% time reduction in touch-up painting |

| Previous Method | New Method | Estimated Increased Life Expectancy or Reduction in Maintenance Time |
|---|---|---|
| Long oil type paint used in covered hopper cars | Vinyl type | 25% time reduction in repainting |
| Wood floor at doorways of box cars | Steel | 90% time reduction in floor replacement |
| Square and rectangular roof hatches on covered hopper cars | Round | 50% time reduction in repairs |
| Interior of open top cars painted | Unpainted | 25% time reduction in repainting |
| Solid wood floors on pulpwood cars | Open grid steel | 90% time reduction in floor replacement and 75% cleaning time reduction |
| Low tensile steel coupler knuckles | High tensile steel | |
| Tongue and groove floors on flat cars | Ship lap | 25% time reduction in floor replacement |
| Door posts in box cars | Modified | |
| Covered hopper car hopper sheets | Thickened and vibrator brackets applied | |
| Truck brake beam heads | Wear plates applied | |
| Center plates greased | Molybdenum disulphide | |

| Previous Method | New Method | Estimated Increased Life Expectancy or Reduction in Maintenance Time |
|---|---|---|
| Manual brake slack adjusters | Semi-automatic | 75% time reduction in adjusting |
| Charcoal fired heaters on box and reefer cars | Alcohol fired | 75% time reduction in fueling |
| Wood floor racks in doorway or reefer cars | Steel | |
| Exterior of passenger cars painted | Stainless steel | 90% time reduction in painting and 75% time reduction in cleaning |
| Interior of passenger cars painted | Laminated plastics to greatest extent possible | 75% time reduction in painting and 60% time reductioning |
| Air conditioning and refrigeration of passenger cars by ice means | Mechanically | Ice servicing time eliminated 75% overall time reduction |
| Drinking water coolers in passenger cars manually filled | Connected to existing gravity or pressure systems | Manual filling eliminated |
| Brake linkage in passenger cars | Hardened pins and bushings used | 50% time reduction in replacement |

APPENDIX 11
IMPROVEMENTS IN MACHINERY & EQUIPMENT
1952 – 1961

| PREVIOUS METHOD | NEW METHOD | REMARKS |
|---|---|---|
| 1. Air Brake Parts hand-lapped and scraped. | Lapping Machines for machine lapping of Air Brake Parts. Angus, Ogden. | |
| 2. Wheels bored and machined on old slow speed type, with standard steel tooling. | Purchased new Hydraulic Wheel Boring Machines for machining wheels at high speeds with Carbide tooling. Angus, Weston, Ogden. | |
| 3. Slow speed centre drive machines, with standard tooling. | Purchased high speed, double end, end drive axle lathes, employing Carbide tooling. Also converted a number of old style centre drive axle lathes to end drive, and speeded up to employ Carbide tooling. Angus, Ogden, Weston, West Toronto. | |
| 4. Axles burnished on centre drive machines, when axles turned. | Purchased high speed, double end, Axle Burnishing Lathes, employing Stellite rolls. | |
| 5. Axles and Wheels handled and moved manually. | Equipped all Wheels Shops with mechanical handling equipment, axle racks and wheel conveyors. | |
| 6. Wheels removed from locomotive, traction motors removed, and wheels then turned in coach wheel lathe. | Wheel Truing Machines to profile turn locomotive wheels without removal from under locomotive. St. Luc, Alyth. | |

| PREVIOUS METHOD | NEW METHOD | REMARKS |
|---|---|---|
| 7. Majority of gears condemned when worn. | Designed and made Traction Motor Gear Grinding Machine to extend gear life by reprofiling teeth. Angus, Ogden, also similar machine for reprofiling pinion gear teeth. | |
| 8. Tank Cars cleaned manually using hot water hoses. | Tank Car cleaning installation at Ogden, equipped for mechanical cleaning and washing of tank cars. | |
| 9. Passenger Car washing done manually with hand brushes and water. | Car Washing Machines for mechanically washing passenger cars in trains. Toronto, Vancouver. | |
| 10. Bulged ends straightened by manual labour, by means of hand jacks and scaffolding. | Car End Straighteners, bulged ends on freight cars mechanically straightened, by utilizing the weight of the Car through its couplers. | |
| 11. The lifting of cars at wheel changes, done by using Screw type Jacks, hand operated. | Repair points on System equipped with air operated jacks for lifting cars at wheel changes, etc. | |
| 12. Majority of material handling and snow removal done by manual labour. | Extensive purchase over the System of Mobile Cranes, Fork Lift Trucks, tractors, and other labour saving material handling equipment, including Payloaders, Snow Plows, etc., for snow removal, also snow melting pits. | |

| PREVIOUS METHOD | NEW METHOD | REMARKS |
|---|---|---|
| 13. Coal burning – hand fired boilers. | When Power Plant replacements are necessary, or where economically justified boilers replaced or converted to fully automatic oil or gas fired type. | |
| 14. Freight Car Repair Yards presently consist of lengthy tracks, open to the elements, where men must move and materials and tools are transported over long distances from car to car. This is an extremely costly and time consuming method, where quality of work and production is in direct ratio to weather conditions. | "One Spot" freight car repair facilities. It is proposed to equip some major repair yards with one spot repair facilities, these being designed to move cars progressively through a fully mechanized central station within an enclosed area. Each station being further provided with all necessary repair materials and a minimum labour force necessary for the work required. The number of tracks and central work stations will vary in proportion to the size of the yard and its work load. The prototype of these proposed facilities is now being designed and built at the new $17,000,000 classification yard at Agincourt, Ontario. | |

MONTREAL, August 22, 1962

# PART II

# THE LABOUR FORCE ADJUSTMENT PROCESS IN RELATION TO TECHNOLOGICAL CHANGE

## Chapter 1

## The Adjustment Process

Part II of this report describes and analyses the labour force adjustment processes at Angus Workshops over the period 1948-1961. The adjustment process is first examined in terms of employment changes, turnover rates, layoffs and recalls, and resignation and retirement rates; secondly, in terms of the movement of labour within the plant itself, in response to changing employment needs and pressures.

An examination of the data on the adjustment process at Angus Workshops yields nine main conclusions:

1. In looking at employment changes by skill group over the period 1948 to 1961, what is significant is that the ratio of skilled to semi-skilled workers had risen from 1.9:1 to 2.2:1. These two groups made up over 80 per cent of total employment in 1961 and it is clear that within this consolidated group the level of skill has gone up.

Table 25

Employment Changes at Angus Workshops, 1948-1961

| Broad Skill Groups | 1948 | | 1952 | | 1961 | | Index 1948=100 | |
|---|---|---|---|---|---|---|---|---|
| | No. Emp. | % of Total Emp. | No. Emp. | % of Total Emp. | No. Emp. | % of Total Emp. | 1952 | 1961 |
| Skilled workers (incl. foremen) | 3,351 | 54.9 | 4,571 | 56.8 | 1,888 | 55.6 | 136 | 56 |
| Semi-skilled workers*..... | 1,772 | 29.0 | 2,279 | 28.3 | 843 | 24.8 | 129 | 48 |
| Unskilled workers**..... | 904 | 14.8 | 1,100 | 13.7 | 571 | 16.8 | 122 | 63 |
| Clerical staff.. | 80 | 1.3 | 102 | 1.3 | 94 | 2.8 | 128 | 118 |
| Total employment | 6,107 | | 8,052 | | 3,396 | | | |

Source: Appendix 1, Part II.
* Helpers plus apprentices.
** Labourers plus boys.

The relative movements of the different broad employee groups are of some significance in relation to the skill composition of the work force at Angus. The increase for the semi-skilled group was proportionately less than for the skilled group during the period of traffic increase in 1952. Also, since 1952 the decline in this group has been greater than the decline in any of the other groups.

Table 26

Index of Employment 1952-1961 by Broad Skill Groups

| Skill Group | 1952 | 1961 |
|---|---|---|
| Skilled (incl. foremen). | 100 | 41 |
| Semi-skilled..... | 100 | 37 |
| Unskilled..... | 100 | 52 |
| Clerical..... | 100 | 92 |

Tables 25 and 26 bear out what was said earlier (p. 23) concerning the trends in the skill mix at Angus. Over the period 1948 to 1961 and in relation to total employment:

a) the skilled group has risen from 54.9 per cent to 55.6 per cent;

b) the semi-skilled group has fallen from 29.0 per cent to 24.8 per cent;

c) the unskilled group has risen from 14.8 per cent to 16.8 per cent;

d) the clerical staff has risen from 1.3 per cent to 2.8 per cent;

e) the skilled plus semi-skilled groups have fallen from 83.9 per cent to 80.4 per cent;

f) the skilled plus semi-skilled plus clerical groups have fallen from 85.2 per cent to 83.2 per cent. The ratio of skilled to semi-skilled workers has risen from 1.9:1 to 2.2:1.

It can be seen that it is not possible from these figures to talk about the net change in the skill composition of the total work force at Angus. What is significant, however, in view of their preponderance in total Angus employment, is the change in the skilled/semi-skilled workers ratio. Together, these two groups make up over 80 per cent of total Angus employment. It is clear that within this consolidated group the level of skill has gone up.

2. The annual rates of turnover of staff show very wide variations between different occupations.[1] Using simple unweighted averages, the differences in turnover rates are illustrated in Table 27.

---

[1] Annual rates of turnover are defined as the sum of accessions in a particular year, plus the sum of separations, divided by the average number of employees.

Table 27

Average Annual Rate of Turnover 1953-1961 per 100 Employees

| Occupation | Rate | Occupation | Rate |
|---|---|---|---|
| Machinists..... | 16.7 | Moulders..... | 68.7 |
| Blacksmiths..... | 12.4 | Painters..... | 61.8 |
| Boilermakers..... | 38.5 | Upholsterers..... | 167.5 |
| Sheet-metal workers | 77.2 | Seamstresses..... | 164.4 |
| Electricians..... | 37.1 | Skilled workers..... | 30.0 |
| Carmen..... | 74.1 | Helpers (semi-skilled workers) | 44.6 |
| Pipefitters..... | 32.0 | Labourers (unskilled workers). | 44.2 |

Source: Appendix 4, Part II.

The differences in turnover rates stem from:

a) Differences in seasonal variations in employment of different occupational groups. In the skilled group, the higher turnover rate for carmen (74 per 100 workers) stems from the seasonality of the work patterns in freight and passenger equipment. The helpers in these shops are subject to the same seasonality while their proportion in the total employment figure of helpers is greater. This disproportionality in their distribution biases the effect of seasonal variations in carmen helper employment in an upward direction.

The high rates of turnover of sheet-metal workers, painters, upholsterers and seamstresses may also be traced to the seasonal changes in the demand for them at the workshop. These groups are employed in the repair of passenger equipment, the maintenance of which has tended to be concentrated in particular short periods each year. The seasonality in passenger repair work reflects itself in the high turnover rates of employees preponderantly employed in these shops.

The employment distribution of particular groups is seen in Table 28.

Table 28

Average Number Employed

| | 1948 | | 1961 | |
|---|---|---|---|---|
| Employment Group | Locomotive | Car | Locomotive | Car |
| Sheet-metal workers..... | 16 | 149 | 5 | 81 |
| Painters..... | 35 | 188 | 16 | 90 |
| Upholsterers..... | | 58 | | 31 |
| Seamstresses..... | | 11 | | 4 |
| Electricians..... | 42 | 44 | 81 | 25 |

Source: Table 6, Part I.

Appendix 4, Part II, does not give all the information required for a precise explanation of differential turnover rates by year and by occupational group. But the reduction in passenger car repair work in relation to the contraction in total repair work certainly partly explains these differentials, and also the continuing high turnover rates among upholsterers and seamstresses, who specialize in passenger equipment repair.

This statement is borne out to some extent by the case of the electricians' group. The growth in the number of electricians and the shift in their distribution towards locomotive repair has greatly reduced their turnover rates over the period.

b) Non-discrete movements in employment, which tend to bunch accessions and separations in particular years and thereby bias the average turnover ratio in an upward direction.

Two apparently erratic rates of turnover are those relating to boiler-makers and moulders. Part of the explanation lies in the smallness of the average numbers of these employees, which enhances the proportional value of all absolute changes in their employment. Also a partial explanation of irregularity in the turnover rates is management's policy of changing employment totals in a non-discrete way. The high average turnover rate of moulders is due almost entirely to the very high turnover rates occurring at the end of the period, in 1960 and 1961, with the closing of the Wheel Foundry.2/

c) Differential rates of movements in occupational groups for reasons other than those of seasonal and cyclical variations. This category is required to explain the relatively high rates of turnover of labourers.

The need for a separate explanation stems from the fact that labourers have generally been less subject to seasonal and cyclical variation in their employment than helpers. On occasions (e.g., 1953 and 1956) when the turnover rates for labourers were significantly higher than the rates for helpers (See Appendix 4, Part II), the reason might have been that the seasonal patterns offset the cyclical pressures to some extent.

However, other factors which have caused the turnover rate to fall over time in the case of helpers (e.g., the decline in passenger service, the growth in the percentage of stainless steel cars in total passenger cars, and the growth in the volume of olden passenger equipment declared redundant) do not apply to labourers.

Thus while there may be independent reasons why the level of labourers' turnover rate is high, it is almost certain that the main cause is similar to that of the other skill groups, namely, the high but declining rates of layoff, restarts, and hires.

---

2/ The small numbers of moulders employed plus the bunching of moulder layoffs results in a standard error of the regression coefficient of 17.24, the highest for all the occupational groups at the workshop (See Appendix 5, Part II).

3. Layoffs account for a very large percentage of total separations at Angus over the period studied. A breakdown of separations at Angus since 1953, showing the proportion of separations which were comprised of layoffs across the broad skill groups, is given in Table 29.

Table 29

Percentage of Separations Taking the Form of Layoffs 1953-1962
(average for 10 years)

| Skill Group | Per Cent |
|---|---|
| Skilled employees | 87.3 |
| Semi-skilled employees | 81.3 |
| Unskilled employees | 79.3 |
| Clerical and supervisory | 6.4 |

Source: Based on Appendix 3, Part II.

These figures may seem surprising if it is borne in mind that:

a) between 1952 and 1961, semi-skilled employees declined in number by 63 per cent compared with 59 per cent for skilled employees. This would indicate a higher incidence of redundancy among semi-skilled employees.

b) with similar turnover rates for semi-skilled (helpers) and unskilled employees (labourers) (44.6 and 44.2 per cent respectively) but with a difference of 15 per cent in the changes in their employment levels (63.0 and 48.0 per cent respectively), it might be expected that the percentage of separations taking the form of layoffs would have been considerably lower among unskilled than semi-skilled employees. However, as the discussion in this chapter will tentatively conclude and as can be verified from figures included in Appendix 3, there is strong reason to believe that resignation rates vary inversely with skill, length of service and, though this cannot be shown in this study, with age. On the other hand, retirements at Angus have varied positively with skill. While this detracts from the value of the preceding sentences as an explanation of the lower percentage of separations taking the form of layoffs as skill level decreases, it bears out the presumption that at Angus age and level of skill are positively correlated. Thus the impact of the differential resignation rate between skill levels can be confidently regarded as the principal explanation of the differential in the incidence of layoffs in separations between skills. Put simply, the greater the skill of a group, the less ready are its members to resign and therefore the greater will be the percentage of separations which will take the form of layoffs.

4. Restarts from 'reduction of staff' (ROS) account for a very large percentage of total accessions at Angus over the period studied. The proportion of accessions which is comprised of restarts from ROS for the broad skill groups can be seen in Table 30.

Table 30

Percentage of Accessions Taking the Form of Restarts from ROS, 1953-1962 (average for 10 years)*

| Skill Group | Per Cent |
|---|---|
| Skilled employees..... | 90.4 |
| Semi-skilled employees..... | 83.5 |
| Unskilled employees..... | 78.6 |

*Based on Appendix 2, Part II.

One fact which these figures pointedly show is that the possibility of retraining redundant workers for intra-plant movement has been virtually insignificant. In all skilled grades from 1957 through 1962, only 37 new men were hired. Any vacancies that arose have constantly been met by recall from layoff on a seniority basis. In semi-skilled grades between 1957 and 1962, only 25 new men were hired; in the unskilled group only two.

The conclusion to be drawn from the statement concerning the constant existence of laid-off workers, who were not merely laid off from Angus but also actually available for recall (i.e., would and did return to Angus on recall) is that the size of the redundant staff has been constantly greater than the rate of wastage.

However, there are indications that this is becoming less true. For all groups, the rate of 'transfers into Angus' from outside points is increasing as the percentage of Angus accessions and the 'restarts' percentage is decreasing (see Appendix 2, Part II). Also, in several occupations, scarcities of manpower are evident, an indication that the number of men on layoff and transfer in these groups is approaching zero. Since the excess supply of labour at Angus seems to be approaching manageable proportions, it would seem wise for management and unions to use this developing opportunity, to make widespread changes in seniority groupings and rules, in apprenticeship programs for railroad work, and possibly in the structure of union representation at the plant.

5. The rates of turnover of labour in most of the employee groups have been decreasing over the period 1953 to 1962. The statistics which follow show that, in general, the turnover rates for Angus personnel are declining (see Appendix 4, Part II). These statistics cover the period 1953-1962, and the relationships which have been developed are linear even though certain cases might have been better described by curvi-linear functions. (This would have been true of the moulders.) However, the linear regressions give trend lines which provide sufficient grounds for believing that they are an important way of determining areas of scarcity before such scarcities actually occur. Moreover, they serve as pointers to the trends of turnover rates by occupation over time.

An example of the way in which these equations may be relevant for predictive purposes can be illustrated by reference to carmen. This group has had a turnover rate which has the trend line described by the equation $Y_7 = 106.00 - 6.38\ X$. (See Appendix 5, Part II).

Regarding 106.00 as the turnover rate value in December, 1952, the trend line shows 106.00 - (9 X 6.38) = 57.42 as the turnover rate for 1961. Extrapolating this trend line, the year can be arrived at where the turnover rate would reach a rate that was made up only of normal wastage (around 7 per cent per year) and its necessary replacement hirings.3/ The trend line shows that this rate (around 14 per cent) will be attained in 1968 to 1969; of course, this does not mean that many of the carmen on layoff at present will not find temporary jobs at Angus until then; seasonal variations in employment may result in temporary scarcities of carmen before that time. However, the trend line suggests that, with the given wastage rates and turnover rates, employment of carmen at Angus will become stable by 1968 to 1969. The wastage rate will then be the sole source of carmen vacancies, and the carmen on layoff at that time can expect to be absorbed into permanent staff at a rate equal to the rate of wastage.

Information of this kind is most significant and would clearly be helpful in indicating to railway employees the potential security of their jobs and in providing guidance to those concerned with retraining as to whether the probability of re-absorption of laid-off workers in their own trades lessons or intensifies the need for retraining.

Calculations of turnover trends and wastage rates show that approximate stabilization in manpower totals has occurred or will occur in other occupations at Angus as follows (See Appendix 4, Part II):

| | |
|---|---|
| Sheet-metal workers | 1966-67 |
| Electricians | 1960-61 |
| Pipefitters | 1961-62 |
| Painters | 1962 |
| Helpers | 1964-65 |
| Labourers | 1962 |

In interpreting this forecast, it can be said, for example, that, in the case of sheet-metal workers, the approximate year in which the turnover rate will be composed only of the wastage rate plus replacements will be 1966-1967. However, it is not known whether these workers will become scarce before this time, i.e., whether their numbers on ROS from Angus will reach zero before this time. But it is implied that, if in 1966-1967, sheet-metal workers still remain on ROS, they will be re-absorbed on a permanent basis at a rate equal to the wastage rate from that time onwards. The other occupations can be analyzed similarly with respect to their predicted stabilization years.4/

6. The rates of turnover between the different occupational groups employed at Angus show a high degree of inter-correlation. This emphasizes that the main factors influencing the turnover rates are factors internal to the workshop.

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3/ The normal wastage rate is taken here to mean employee departures from the Angus roll because of resignation, retirement, death and dismissal.

4/ The average wastage calculated for the years 1957 to 1962 is shown in Appendix 4, Part II together with the predicted year when turnover rate attains equality with the wastage rate multiplied by two. For some occupations the standard error of the regression coefficient is as great as or greater than the regression coefficient, so that predictions in these cases would not be meaningful.

In view of the limited number of observations (9 for each occupation) that were available for computation purposes, the occupations were divided into three groups for the purpose of computing a multiple correlation coefficient to assess their inter-correlation. The derived coefficients were as follows:

0.8943 (machinists, blacksmiths, boilermakers, sheet-metal workers, electricians, carmen)

0.9501 (moulders, painters, upholsterers, seamstresses, pipefitters, helpers, labourers)

0.6735 (apprentices, boys, clerks, foremen, miscellaneous).

The lower coefficient in respect of the more varied third group is to be expected in view of the different policies and motivations in this group.

The high correlation for turnover rates among the 13 occupations and skill levels included in the first two groups is significant. It means that, in the absence of contrary evidence, the conclusion could be drawn that the turnover rates for Angus employees are not significantly determined by external factors. Such external factors would be expected to affect different occupations differently. That is to say, if the turnover rates inside Angus were significantly influenced by the 'push and pull' of labour market pressures outside Angus (i.e., in the Greater Montreal area), only a low degree of inter-correlation would be revealed between the turnover rates of the various occupations employed at Angus.

Of course, this statement must be qualified by noting once more the preponderance of restarts in total accessions and layoffs in total separations. Since these two items play such an important role in the turnover of all non-office and supervisory grades, the high inter-correlation which the statistics actually show is not unexpected. Another intuitive reason for expecting to find a high degree of inter-correlation is that, since the reductions in staff have tended to increase the average age of remaining employees, it would also be feasible to expect death and retirement rates to increase and resignation rates to decrease for all occupational groups. This has been the case as will be shown later on.

If the rate of layoffs, deaths and retirements are excluded, it will be seen that the rate of resignations also moves sympathetically with internal turnover rates. The figures in Appendix 6, Part II, show an unmistakable downward trend in the rate of resignations (total resignations in a year by occupation/average number employed in that year by occupation) comparable with the downward trend in the turnover rate.5/

What this seems to suggest, as a general conclusion, is that the main factor in determining voluntary resignations from the workshop has

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5/ It may be pointed out that this trend is not subject to the criticism which might be made of using as evidence for the conclusion a correlation between numbers of laid-off workers in a year and the resignations in that year. Some correlation would be expected between these figures because of the influence on both variables of the decline in total employment. This is not a valid criticism of the trend in resignation rates.

been the degree of job security the plant has been able to offer rather than the pull of labour market forces outside the workshop.6/

Two qualifications need to be made. First, one would expect the resignation rate to fall as the average age of employees rises. Second, and more important, the resignation rate trend for certain occupations does not correspond to that of the broader skill group. This is particularly true for electricians. From 1953-1961, the resignation rate for this group has taken the form shown in Table 31 and Chart 2. The turnover rates for electricians are shown in Chart 1.

Table 31

Resignation Rate as a Percentage Figure: Electricians

| Year | Per Cent | Year | Per Cent |
|---|---|---|---|
| 1953 | 5.6 | 1958 | 1.9 |
| 1954 | 1.2 | 1959 | 3.2 |
| 1955 | 3.6 | 1960 | 6.0 |
| 1956 | 2.7 | 1961 | 0 |
| 1957 | 1.4 | | |

7. Resignation rates tend to be lower and more stable the greater the level of skill. During the period 1953-1961, the average rates of resignation for the broad groups employed at Angus were as listed in Table 32.

Table 32

Percentage Rate of Resignation Average 1953-1961

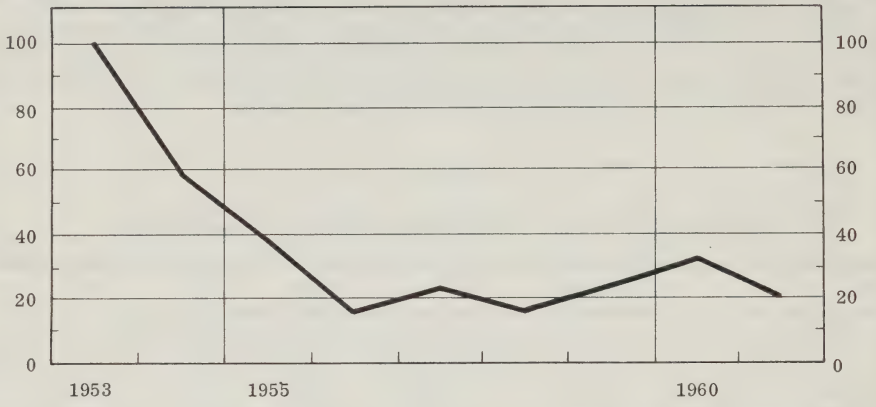
| Skill Group | Per Cent |
|---|---|
| Skilled..... | 1.3 |
| Semi-skilled..... | 2.8 |
| Unskilled..... | 4.1 |

These figures exaggerate, to some extent, the differential in the resignation rates between the skill groups. It is possible that the average age of employees varies directly with skill, and it is fairly

6/ This conclusion would have to be modified if it were true that over the period 1953-1962 the Greater Montreal area had been experiencing an upward trend in general unemployment rates, that is, that the excess supply of labour had been growing. Such a trend would reduce the secular pull of outside forces and, consequently, the encouragement inside Angus to resign voluntarily so as to take another job.

Chart 1

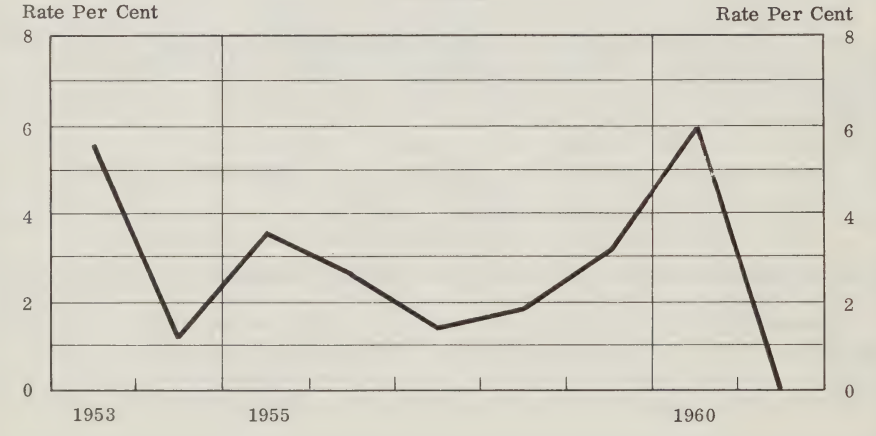
TURNOVER RATE: ELECTRICIANS
1953-1961




(Data drawn from Appendix 4)

Chart 2

RESIGNATION RATE: ELECTRICIANS
1953-1961




NOTE: Charts 1 and 2 show a possible sympathetic relationship between the two rates. But there does appear to be an element of dependence in the resignation rate which makes it seemingly not subject to the 'current security' or 'rising average age level' factors. Of course, since the figures involved in the resignation rate are small, it would be reasonable to expect the percentage movements to be exaggerated. However, the point seems to be worthy of mention in view of the apparently lesser response of electricians to internal workshop pressures, and their correspondingly greater response to the external labour market pressures.

certain that average length of service increases as the skill level considered increases. Both these factors have the effect of reducing resignation rates as the skill level considered rises.

The data are deficient in that the statistics relevant to establishing differentials in average age and average length of service for the different employee groups are not available. Assuming that average length of service also varies directly with skill level, three propositions might be stated:

1. the higher the level of skill, the lower the resignation rate tends to be;

2. the higher the average age, the lower the resignation rate tends to be;

3. the higher the average length of service in the workshop, the lower the resignation rate tends to be.

Now, there seems to be no way in which to show a true relationship between the level of skill and the degree of mobility of labour--equating for this purpose mobility with resignation rates. The greater the degree of skill a person has, the greater would tend to be the alternative sources of available employment and the greater the possibility of movement.7/ Similarly, the preponderance of workers who "can't land a job" would tend to be in the unskilled group. Thus the importance of holding on to a job once acquired would be greater. The figures seem to indicate that, in general, skilled workers are more willing and anxious to hold on to their jobs than unskilled workers, or are given a greater incentive by management to do so.

The relative effects of these forces would require a more detailed study than is possible with the data available in this case. However, there is some justification for the belief that at Angus the response of skilled workers to a change in the pattern of economic security is less than the response of the unskilled workers, but it seems to be the minimum proposition that can be made.

8. Concerning rates of retirement, two different propositions may be made from the Angus figures over the period 1953 to 1961.

1) Rates of retirement for the skilled and semi-skilled groups have increased over the period.

2) Rates of retirement tend to be higher for those whose levels of skill are higher.

In viewing the fact that retirement rates for skilled and semi-skilled groups have increased over the period, it might be said that this would be an expected result of rising average age of staff in consequence of staff reductions. This is probably true. However, it is then surprising to find that the rate of retirement for unskilled workers has

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7/ This would seem to be untrue in the case of highly specialized skills which, in addition, are capable of being executed only in particular industries, e.g., railway firemen and engineers. However, it does not nullify the general proposition that people with higher skills also tend to have higher degrees of intelligence, ambition, determination, foresight, which are the basic requirements for mobility in our economy.

not increased, despite a reduction in their employment level to 50 per cent of their 1952 level. It is doubtful that this seriously undermines the justification for making the first proposition depend upon the increasing average age of the skilled groups. At least three reasons may be adduced to give a partial explanation of the fact that rates of retirement of the unskilled group have not risen over the period.

First, the rate of retirement for a particular group is determined by a number of factors, many of which will have affected the age composition of the group in the years prior to the period under review. Thus, an accurate analysis would require more observations than we have at our disposal.

Second, the lesser degree of attachment of unskilled labour to Angus during periods of employment instability means that the age composition of the group is more random in character. This would mean that a greater degree of randomness would be present in the retirement rate over time.

Third, the seniority list for labourers at Angus is broken into two independent sections--one for car labourers, and another for locomotive labourers. While this does not mean that the movements in labour-age composition in the two groups have nullified one another, it does mean that the impact of employment reduction on the age composition of the group is, as a whole, much less than would be suggested by the consolidated list reduction of 50 per cent.

Once again it would appear that there is some doubt about the adequacy of these explanations for seeming contradictions. But in view of the limitations of the data, educated and reasonable guesses seem to be the only practical approach.

9. The reduction in staff at Angus Workshops. Staff reduction has been of such size that the layoffs and restarts included in the turnover rates have not been confined only to particular employees engaged to meet seasonal and cyclical maintenance requirements, but have also been experienced by some of the long-service Angus employees.

In devoting a separate short section to the composition of laid-off personnel, it is not proposed to show in detail the lengths of service of Angus personnel who have experienced layoff in the period under review. To do so would require much more information than has been collected and the examination of a very large number of record cards, even if only a sample were studies.

An idea of the process of instability and contraction may be gained from the statistical picture of the boilermakers' trade at Angus over the years 1953 to 1961 (see Appendix 8, Part II). It is not intended that this description should be regarded as completely representative of all trades. Moulders and upholsterers have undoubtedly been more deeply affected; the figures for machinists would probably be similar in proportion to those of boilermakers, pipefitters, blacksmiths and electricians have been less affected in terms of the layoff of long-service employees.

In general, Appendix 8, Part II is self-explanatory, but it might be helpful if the following two points of interest and qualification were noted:

a) The inclusion of 63 boilermakers who were employed at Angus in January 1953 but who experienced no layoff before leaving Angus for a 'non-layoff' reason should not be regarded as distorting the picture unduly. Assuming a constant 'non-layoff' quit rate over the period, this figure is halved and the percentage of 1953 employees who experienced no layoff would be roughly 50 per cent. If rough weighting techniques are used, it can be said that, over the period 1953-1963, one half of the boilermakers who were employed at Angus in January 1953 experienced a total layoff period of $5\frac{1}{2}$ months at one time or another. Admittedly, there is no measuring rod to establish an index of layoff incidence. But it would probably not be too conservative to regard this as having been a serious layoff situation amongst these tradesmen.

b) Of the boilermakers hired since January 1953, little need be said except to note that temporary transfer to outside points (Glen Yard, St. Luc or Farnham) explains the seeming anomaly in the continuous employment of some of these junior men. Under current seniority rules men displaced at Angus on seniority may find jobs at St. Luc. These jobs would be filled by the junior men from Angus, who must be the first to leave Angus. However, these men accumulate seniority at the outside points and, under existing rules, cannot be displaced by the more senior Angus men if and when the latter are laid off.

In any examination of the distribution of economic gains and losses under conditions of technological change, it is clear that a quantitative estimate (such as the layoff period experienced by different groups) would be invaluable. It is not suggested here that the layoff experienced by the boilermakers who were employed at Angus in 1953 is completely accurate; nor is it suggested that the same period of layoff would be true for other groups. In addition, a qualification would be necessary to the effect that at least some of the Angus layoffs result from decreases in the absolute volume of services rendered to the public, especially in the passenger carrying sector. Also, the extent to which changes in the relative prices of capital and labour may be a factor in the history of Angus employment over the period under review is not known. If the last mentioned factor is significant, then the distribution of gains and losses (between the public who gain and the labour element which loses) is less clear. What this factor assumes is that the unemployed labour element which loses does so in favour of the employed labour (in the form of higher wages, etc.).

However, the report is not concerned with this issue, but rather to show the pervasiveness of layoffs at Angus over the period. The only trade for which it has been practicable to derive quantitative estimates of the layoff incidence has been that of the boilermakers, but the figure would be comparable for several other trades, helpers' groups and the labourers' groups.

This generalization is partly borne out by a statistical analysis made by the CPR authorities of Angus employees who were on layoff on December 1, 1962. Some of the most affected groups are shown to have layoff characteristics regarding length of service as shown in Table 33. This Table shows that on December 1, 1962, the employees then on layoff from Angus included men of very long service. In the case of carmen, the modal length of service of laid-off employees is seen to be 11 years--that is, the employees in the modal group had been taken into that seniority group in 1952. Of the 143 employees in this group, a further breakdown

Table 33

Number of Employees on Layoff from Angus Workshops by Length of Service
December 1, 1962

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carmen | Years | 4 | 5 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 18 | 20 | 21 | 36 |
| | No. | 1 | 2 | 4 | 1 | 48 | 94 | 143 | 11 | 3 | 8 | 4 | 1 | 1 | 1 | 3 | 1 |
| Helpers, Carmen | Years | 6 | 9 | 10 | 11 | 12 | 13 | 14 | 19 | 39 | | | | | | | |
| | No. | 1 | 1 | 18 | 21 | 7 | 6 | 1 | 1 | 1 | | | | | | | |
| Sheet-Metal Wkrs. | Years | 6 | 7 | 10 | 11 | 12 | 13 | 14 | 15 | 18 | 22 | | | | | | |
| | No. | 3 | 1 | 9 | 10 | 3 | 15 | 5 | 4 | 1 | 1 | | | | | | |
| Moulders, Wheel Foundry | Years | 20 | 21 | 22 | 28 | 33 | 39 | | | | | | | | | | |
| | No. | 1 | 2 | 1 | 3 | 1 | 1 | | | | | | | | | | |
| Painters | Years | 7 | 9 | 10 | 11 | 13 | 16 | 17 | 18 | 19 | 20 | 21 | 37 | 39 | | | |
| | No. | 1 | 6 | 12 | 18 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 1 | 2 | | | |
| Labourers, Locomotive Shop | Years | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | |
| | No. | 11 | 8 | 3 | 3 | 7 | 3 | 6 | 4 | 5 | 3 | 7 | 14 | 9 | 5 | | |

shows 67 were employees who, on December 1, 1962, had been laid off for less than a year. The total layoff figure included some persons taken on in the early 1950's but who had worked only one year or less before being laid off; some had accumulated 10 years of seniority before being laid off in 1962.

One anomaly which may be noted in the figures is that some persons with low seniority had been on layoff in December 1962 less than others of high seniority. This is not due to any relaxation of recall seniority but to the fact that, if a worker is on layoff but has a job, he may forego recall without losing his seniority unless he can be guaranteed employment for 90 days from the date of recall. In practice, this has been interpreted by management to mean that a person may forego a recall without losing his seniority if he expresses a desire not to return at that particular time. However, such an employee may be forced to respond if the company has none of this trade group on layoff or transfer or if the employee persists in the continuation of his layoff at the cost of inconvenience to the company.

This raises an important issue concerning the experience of the Angus employees on layoff. Information concerning this is extremely limited. The layoff experience of boilermakers who were laid off since 1953 but who are now employed (August 1963) will be discussed later in this report. At this stage, it may be said that only where the job recall was felt to be of a temporary nature (even if for longer than the three months stipulated in their contract, relative to the foreseeable duration of the job then held) did workers tend to turn down recall. For tradesmen, the importance of returning to the workshop to protect pension and seniority rights has been an important consideration in determining an employee's desire to return on recall.

It is not suggested that all the anomalies in the seniority structure of laid-off workers are due to the relative instability of Angus employment over the period under review, but it certainly goes part of the way towards an explanation.

The statistical documentation seems to point to a new position of employment equilibrium at Angus. This would seem to be evident from the downward trends of the turnover rates, the tendency for restarts from ROS to be a falling percentage of total accessions and layoffs of total separations, and the development of scarcities in several occupational groups. The arrival at this new equilibrium seems to be basic to changes in apprenticeship programs to the development of retraining schemes to facilitate more widespread intra-plant mobility and to the reorganization of seniority lines. If this is the case, sensible discussion may now be possible regarding arrangements to provide for greater plant employment security and mobility.

A word may be in place here on the subject of seniority lists. They have their rationale in motives that are certainly not only economic. The delineation of union jurisdiction, the rationing of job opportunities through the setting of rules for inclusion on the list, and the control over craft standards are clearly partly economic and partly political. Moreover, the importance in the minds of workers and union leaders of particular reasons for seniority groupings will change according to the way in which employment is changing. Thus, although economic reasoning in any discussion of seniority lists is very important the reality of the situation is that other considerations must also be taken into account.

Recommendations for change in seniority list arrangements will, of course, depend on what the objectives are in changing them. If the objective is to protect the long-service worker, then the seniority lists should be widened. If it is to provide the worker with an employment unit whose complement is independent of employment movements elsewhere and the boundaries of which are known to the worker, then presumably the narrower the list is the more effective it will be. From the point of view of the economist, however, and in the conditions discussed above, which have created and still are creating pressures for contraction of staff at Angus, the wider the seniority lists, the greater will be the tendency for unemployment to be spread more thinly and evenly over a wider group of employees. From comments heard at Angus from management, union officials and workers, it may be concluded that there was concern over the intensity of the incidence of unemployment in particular groups. It would, therefore, seem reasonable to suppose that discussion could only serve to improve the current seniority list arrangements.

## Intra-Plant Labour Mobility

In this section, it is proposed to examine the movement of labour inside Angus, i.e., intra-plant labour mobility between seniority lists from 1948 on.

First, the rules governing intra-plant transfer, the seniority lists in the plant and the conditions under which movement between lists occur, are described. The section goes on to analyze the way in which the two conclusions listed below are arrived at and emphasizes their implications as discussion points for intra-plant employment policy:

1. The amount of temporary transfers which has been possible as an offset to layoffs in the different seniority groups has been negligible.

2. To the extent that temporary transfers have taken place at Angus, they have consisted mainly of promotions on a temporary basis as helpers to journeymen in their own craft.

The separate seniority lists in operation at Angus at the present time are as follows:

| Classification | Classification |
|---|---|
| Machinists | Bricklayers (B & B Dept.) |
| Helpers Machinists | Sectionmen |
| Platers | Electricians |
| Buffers | Cranemen |
| Oxidizers | Helper Electricians |
| Boilermakers | Truck Operators |
| Helper Boilermakers | Pipefitters |
| Blacksmiths | Helper Pipefitters |
| Welders (Blacksmith) | Sheet-Metal Workers |
| Helper Blacksmiths | Helpers Sheet-Metal |
| Patternmakers | Carmen |
| Moulders (Wheel) | Helper Carmen |
| Bricklayers (Moulder) | Painters |
| Helpers (Moulder Wheel) | Welders |
| Moulders (Grey Iron) | Upholsterers |
| Coremakers | Seamstresses |
| Helper Moulders (Grey Iron) | Dyers |

| Classification | Classification |
|---|---|
| L/H Firemen (Power House) | Glass Bevellers |
| Oilers | Wood Machinists |
| Firemen (Power House) | Beltmen |
| Coal Passers (Power House) | Labourers (Locomotive) |
| Carpenters (B & B Dept.) | Labourers (Car) |
| Painters (B & B Dept.) | Charwomen |
| Rough Carpenters (B & B Dept.) | Clerks |

In order to give some background to the conclusions on intra-plant mobility which shall be discussed later, it is necessary to briefly outline the conditions of permanent and temporary transfer between seniority lists.

An employee is said to be 'working out of craft' when he is employed on a job which falls in the jurisdiction of a craft or group which has a separate seniority list. Normally, a person will not be employed out of his craft if there are laid-off members in the craft in which he is employed.

If there is a demand for workers in one craft (or seniority group) this demand will be filled by:

a) Recall by management or application for return to that craft by men from that craft working temporarily in another craft--in general, these men will be senior to men on layoff.[8/]

b) Recall of men from layoff who are on the seniority list for the craft which is in demand.

c) New hires.

d) Upgrading of men on a temporary basis into this craft from 'helpers'.

e) Transferring of men on a temporary basis from other crafts (or groups) where demand for labour has declined.

The sequence suggested by the above ranking of policies c), d) and e) is not necessarily true in practice. However, policies a) and b) are sequential in practice.

The transfers between seniority lists which arise in consequence of these policies are temporary. They may become permanent if the transferred person opts to transfer to the seniority list of the craft in which he is now a temporary employee and if his time and efficiency requirements have been satisfied. Should he opt for permanent transfer, he loses his seniority in his previous list from the date of the transfer. He is, therefore, junior in the new craft to all earlier entrants, and also to apprentices who complete their time and are promoted to journeymen for two years hence.

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[8/] The policy is to recall men to their own craft whenever a differential exists between the temporary and permanent job pay rates. Where the temporary job rate is less, the men exercise this right; where the temporary job rate is more, management exercises it.

There is no rigid rule governing this sequence of c), d) and e). If the seniority list of a particular craft is exhausted, and there are helpers in that craft who are on layoff, then generally senior helpers will be temporarily promoted and junior helpers recalled to helpers' vacancies.

Given the greater degree of interchangeability of helpers' jobs, management may fill the helpers' vacancies so caused with laid-off helpers from some other craft. Here the governing considerations are length of service and a reasonable closeness of job and employee capacity to perform it.

This general principle of providing as great a degree as possible of priority according to length of service is accepted by management. Unions are not normally involved in this process.

The policy embodied in point e) relating to transfers happens frequently between helpers' grades, but rarely between skilled trades or between skilled tradesmen and helper jobs in other crafts. This infrequency stems from the much smaller degree of interchangeability between crafts and the psychological resentment of craftsmen to working as helpers in crafts other than their own, or as labourers.

If an excess demand occurs in a particular craft, it is very unlikely that other craftsmen on layoff will be recalled to work as temporary workers in the scarce craft. If the helpers' list in the scarce crafts is exhausted, it is unlikely that journeymen will be transferred from other crafts to the one which there is an excess demand. Normally, the new hires will be made from lists of such journeymen on layoff in Montreal. It is very unusual for a union to be unable to meet an excess demand at the workshop resulting from a scarcity of journeymen and the helpers in that craft at the workshop.

Analysis of Permanent Transfers

The wage agreement negotiated between the Railway Association of Canada and Division No. 4, Railway Employees' Department, AFL-CIO, governing Rates of Pay and Rules of Service for Locomotive and Car Departments, contains the following rule:2/

> "In the event of not being able to employ Carmen with five years' experience and the regular apprentice schedule not providing men enough to do the work, the force may be increased in the following manner:
>
> "Regular apprentices who have served three years may be promoted to Mechanics at point employed and will be paid the minimum rate for Carmen, seniority to govern.
>
> "Helpers who have had five or more years' experience at point employed may be promoted to Mechanics, they to receive the minimum rate for Carmen and be given an opportunity to learn the trade, seniority to govern.
>
> "Helpers who are promoted to Mechanic's position and who remain as Mechanics exceeding a period of 90 days, shall lose their seniority as Helpers from the date of their promotion.

2/ Wage Agreement No. 15. Reprinted as amended April 1, 1959, Rule 164, pp. 57-8.

"The duly authorized committee in each shop covered by this Agreement will be consulted and mutual understanding arrived at in promoting Helpers in such cases. The ratio of Helpers to be promoted, to the number of Mechanics in any one shop, shall not exceed twenty per cent.

"The General Chairman on each railway affected shall be furnished with a complete record of the men promoted.

"When a reduction is made in force of Mechanics, promoted Helpers with less than 90 days' seniority as Mechanics, and advanced apprentices, shall be set back in accordance with their seniority. No Mechanics to be laid off until all such promoted Helpers and advanced apprentices have been set back."

A further rule provides that:

"Apprentices shall be credited with two years' seniority as Mechanics upon the completion of their apprenticeship."[10]

The effect of these two rules is such that, in the case of all the Angus crafts (except sheet-metal work), opportunities may become available for helpers to secure permanent promotion to journeymen positions, and for management to avail itself of qualified helpers' labour when a scarcity of journeymen in a particular craft occurs. Second, since the helpers who are temporarily promoted and who qualify for permanent transfer tend to be the most senior men in their seniority group, the decision to transfer is a major one. For 90 days from the time of their decision, they are protected by the reversion clause, but beyond that they are junior to all the journeymen in their new list, and junior to all apprentices who complete their studies over the two-year period extending forward from their date of transfer. Conversely, the decision not to transfer into the journeymen's seniority group is also important. If the helper decides not to transfer when called upon to declare his choice, he will then be demoted to work in his own seniority group and will forfeit future opportunities for temporary promotion.

Four factors are clearly relevant to the decision to transfer. The first is the amount of seniority given up in the transfer from the helper grade. The second is the degree of security which the employee believes he will have in the list into which he transfers. These factors are important and differ in type in that the first is a known quantity, whereas the second can be quantified only in terms of probability and a wide variation might exist in the probability estimate of any two different persons. The third is the 'security-consciousness' of the individual which would vary with his personality type and his financial commitments and responsibilities. The fourth is the pay differential between the helper grade to which he would commit himself by a decision not to transfer and the journeyman grade to which he would commit himself by a decision to transfer.

Some estimate of the extent of the permanent transfer process may be gained from Table 34, which classified the skilled grades in January 1963 according to the total number of journeymen working permanently in each grade and the number of promotees contained in that total. A further class is listed which gives the number of the promotees who had transferred permanently since January 1, 1948.

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[10] Ibid., p. 28.

Table 34

Promotees in Employee Seniority Groups, Jan. 1, 1963, and Number of Promotees to Each Group Since Jan. 1, 1948

| Crafts | 1<br>No. of Men in the Group Jan. 1, 1963 | 2*<br>No. of Promotees in the Group | 3<br>No. of Promotees Transferred since Jan. 1, 1948 |
|---|---|---|---|
| Machinists | 522 | 30 | 3 |
| Platers | 1 | 1 | 0 |
| Buffers | 11 | 3 | 0 |
| Oxidizers | 9 | 4 | 0 |
| Boilermakers | 63 | 2 | 0 |
| Blacksmiths | 49 | 7 | 1 |
| Welders (Blacksmith) | 2 | 0 | 0 |
| Patternmakers | 5 | 0 | 0 |
| Moulders (Wheel) | 10 | 9 | 4 |
| Bricklayers (Moulder) | 1 | 1 | 1 |
| Moulders (Grey Iron) | 7 | 0 | 0 |
| Coremakers | 1 | 0 | 0 |
| Carpenters (B & B Dept.) | 19 | 13 | 10 |
| Painters (B & B Dept.) | 4 | 2 | 0 |
| Bricklayers (B & B Dept.) | 5 | 4 | 0 |
| Electricians | 179 | 14 | 9 |
| Pipefitters | 110 | 29 | 16 |
| Sheet-Metal Workers | 166 | 0 | 0 |
| Carmen | 969 | 281 | 125 |
| Painters | 179 | 34 | 23 |
| Welders | 73 | 21 | 11 |
| Upholsterers | 43 | 1 | 1 |
| Seamstresses | 6 | 0 | 0 |
| Dyers | 2 | 1 | 1 |
| Glass Bevellers | 2 | 0 | 0 |
| Wood Machinists | 60 | 5 | 3 |
| Total | 2,498 | 462 | 208 |

*"Promotee" is defined here as a man who has transferred to a journeyman's seniority list from a journeyman and helper list in that trade.

It would be interesting to attempt to explain how individuals make this decision to transfer between seniority lists. However, the data for this type of study have not been collected. Here, it is possible only to set out the figures without going any significant way towards explaining them.

A detailed breakdown of the 125 helper carmen who have opted to transfer to the carmen list since January 1, 1948 is found in Table 35.

The breakdown shows that, of those who do accept permanent transfer, the great preponderance consists of employees who do not surrender long service in their former list. It is interesting to note

that, in each listed transfer year, some long-service men decided to 'take a chance' on holding their positions on the journeyman list. A breakdown of the painter transferees shows the same fact. Between 1948 and 1952, 22 painters' helpers decided to transfer; 20 had fewer than 8 years' service as helpers, two had over 25 years. Both of the latter are now laid off, but they would not have been laid off if they had not made this decision to transfer.

Table 35

Year of Transfer and Length of Seniority Surrendered on Transfer

| Year | Total Transferees | Years of Service Surrendered | | | |
|---|---|---|---|---|---|
| 1948... | 22 | Less than 2 yrs. 18 | 10 - 11 yrs. 2 | Over 20 yrs. 2 | |
| 1949... | 46 | 2 yrs. 38 | 2 - 4 yrs. 4 | 20 yrs. 4 | |
| 1950... | 14 | 2 yrs. 2 | 2 - 4 yrs. 10 | 20 yrs. 2 | |
| 1951... | 24 | 2 yrs. 8 | 2 - 4 yrs. 13 | 20 yrs. 3 | |
| 1952-57 | 16 | 2 yrs. 3 | 2 - 5 yrs. 8 | 5 - 10 yrs. 3 | 10 yrs. 2 |

Of the recorded 208 transfers since January 1948, (See Table 34, Col. 3) only two have been more recent than January 1958. This is not in itself a conclusive indication of the weekness of the future security factor in the decision to transfer, but is related rather to the fact that, in periods when most of the groups have had members on layoff, there were no persons who were given an opportunity to decide. Of course, these two forces tend to operate together.

However, it may be significant to note that the initiative to decide on transfer usually comes from management. This is borne out to some extent by the fact that at present eight electricians' helpers and 14 pipefitters' helpers are working as temporary journeymen. Since it is known that scarcities have developed in these Angus trades, it should be interesting to note whether these men would continue as helpers if management were to start replacing journeymen, separated from Angus for wastage reasons, through hiring new men rather than promoting helpers. At some stage it is obvious that the helpers would want to transfer.[11]

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[11] This paragraph should be qualified. It is not known how stringently the rule is enforced that the total number of journeymen may not be composed of more than a stated percentage of promoted helpers. If the 20 per cent rule applies, then it can be seen to be exceeded in the case of pipefitters but not exhausted in the case of electricians.

Analysis of Temporary Transfers

The amount of temporary transfers which has been possible as an offset the layoffs in the different seniority groups has been negligible. The fact that any policy of transfers to reduce layoff would not have been practicable as a general policy over the period under review is due to the fact that in almost all groups there have been excess supplies of labour.

To the extent that temporary transfers have taken place at Angus, they have consisted mainly of promotions on a temporary basis of helpers to journeymen in their own crafts. No comparative statistical evidence is available to substantiate this proposition, but in examining the records of the men who in August 1963 were 'working out of their own craft', the following breakdown may be seen.

Between July and August, 1963, 95 employees at Angus were recorded as working out of their own craft. The nature of the temporary transfers to which they were subject is described in Table 36, which emphasizes several points of interest regarding intra-plant mobility.

If the 22 labourers (locomotive) are excluded, the proportion of temporary vertical promotions in the total number working out of craft is 40 per cent.

Table 36

Employees at Angus Workshops Working Out of Their Own Craft - July and August, 1963

| Seniority Group | Direction of Transfer | | | | |
|---|---|---|---|---|---|
| | Vertically Up | Vertically Down | Diagonally Up | Diagonally Down | Horizontal |
| Helper Machinists..... | 1 | | 1 | | |
| Helper Boilermakers..... | 5 | | | | 1 |
| Helper Blacksmiths..... | 1 | | | | |
| Moulders (Wheel Foundry)... | | | | 8 | |
| Bricklayers (Wheel Foundry) | | | | | 1 |
| Helper Moulders..... | | | | | 15 |
| Moulders (G.I. Foundry).... | | | | 1 | |
| Helper Electricians..... | 8 | | | | |
| Helper Sheet Metal..... | | | | | 7 |
| Helper Pipefitters..... | 14 | | | | |
| Carmen..... | | | | 2 | |
| Helper Carmen..... | | | 2 | 1 | 2 |
| Labourers (Loco)..... | | | 22 | | |
| Labourers (Car)..... | | | 3 | | |

Since the promoted employees are the seniors in the helper group, it is clear that a large part of the helper group is qualified by experience to do the work of the craft it helps. Moreover, since they are not required to display full capability over all the jobs falling within the jurisdiction of the journeyman's trade, the amount of training that is required to perform the designated tasks is minimal.

If the 22 labourers (locomotive) are excluded, the proportion of temporary horizontal transfers of helpers in the total working out of craft is 36 per cent. This figure shows the high degree of interchangeability of helpers between the different crafts which they help. However, the fact that their numbers have been reduced in proportion--in comparison with the other groups--shows that this interchangeability has provided little protection against the layoff pressure within the helper groups. The only reason that can be adduced to explain this non-effectiveness of interchangeability is the ubiquity of the layoff numbers in each seniority group.

The fact that none of the employees among those working out of their craft went into jobs which were vertically downwards in the promotion line from those in which they held permanent seniority illustrates the job-protectiveness of the seniority arrangements. It tends to show also that the journeymen and helper groups tend to move very significantly together. Were this not so, it is certain that there would be instances of temporary demotion to fill vacancies in helper groups.

In Table 36 the existence of 12 men who were employed in jobs diagonally downward from their permanent list does not significantly reduce the accuracy of this statement on the protectiveness of the seniority arrangements. It will be seen that 9 of the 12 were moulders. By agreement between management and unions, the policy relating to moulders was modified to provide for acceptance of moulders in any helper grade where vacancies arose. The fact that their redundancy on the closing of the Wheel Foundry has coincided with scarcities at particular journeymen levels has allowed for the retention in employment of many of these very long-service employees.

The fact that moulders have been absorbed in this way only by a special agreement serves to emphasize the self-protectiveness of the seniority arrangements of each group. However, it would appear probable that this practice will become possible on a wider scale as the number of seniority groups which have no redundant members grow.

The complete absence of the skilled trades in the horizontal class of movement indicates an absence of shifts on a temporary basis between crafts.

This statement, on the evidence of the statistics, only bears out the intuitive expectations mentioned earlier in this respect. The existence of considerable job differences between scarce and abundant crafts, the permanence of available labour in all crafts in the Greater Montreal area, and the greater capacity of an experienced helper to perform a journeyman's work in that trade provide reasons for the absence of horizontal temporary transfer at the journeyman level.[12]

The movement of labourers (locomotive) diagonally upwards has been ignored here in establishing the significance of other movements, because these changes have largely been to higher-paid labourer categories.

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[12] It would be misleading if this statement were to be interpreted as a statement that no horizontal transfer occurs at the skilled level over time. Angus records held many instances of employees who, several times in one craft, became redundant in that craft and were taken on as helpers in other crafts, and finally accumulated enough seniority and experience at that level to become permanent promotees in the new craft. However, their numbers are insignificant in the total intra-plant changes over the same period.

The promotion of labourers to coal passers (labourers, powerhouse seniority list) or to truck operators (truck operators seniority list) carries higher wage rates.

There is now way of finding reasons for the lack of vertically upward mobility in the labourers' group. Of course, if labourers were categorized as helpers are, some vertically upward promotions would be indicated in Table 36. Statistics are not available to show in percentage form how many of the journeymen and helpers at Angus started their careers as labourers. In any case, it would be difficult to arrive at a significant percentage figure in this respect, because the helper groups were still (August 1963) groups in which there was an excess supply of labour.

While it would be interesting to find a measure of labourer upward mobility, we cannot attempt such a measure. All that can be done is to raise the question as to whether or not the generalizations of the labourers' concept has helped or hindered the intra-plant mobility of labourers over time.

Comparing the figures of 'men working out of their own craft' over the period 1960-1963 leads to the conclusion that the main determinant of temporary transfers is the scarcity in the craft to which men are transferred rather than the redundancy in their own craft.

Here again, it is necessary to qualify the conclusion that the moulders and moulders' helpers do not conform to this general case. But they are an exception to the rule.

Over the period from 1960 to mid-1963, scarcities developed among several trades. Vacancies arose from attrition and required decisions on the policy to be followed in filling them. The growth in the number of personnel in crafts other than their own reflects the management policy of filling such vacancies by temporary promotion, and machinists' helpers, boilermakers', and pipefitters' vacancies have been filled by upgrading of helpers. This shows that the main determinant of temporary transfers is scarcity in crafts (rather than excess supply in helper grades), a fact that can be accepted if it is borne in mind that the transfer rate has grown as the layoff rate has declined.

The reasons for this have been that: 1) management preferred to use labour resources already employed at Angus or on the Angus roll rather than resort to drawing in fresh employees; 2) the seniority rulings and layoffs in almost all groups up to 1961-1962 made it impossible to adopt any effective policy of internal transfer to absorb redundant workers and 3) the helper grades are able to perform skilled work up to certain limits determined by the variability of the work requirements.

It may be that the technological changes at Angus have reduced the variability of Angus work and simplified work processes, and is a reason for the seeming dilution of skill grades over the past three years. But the period is far too short to really justify this assumption. Also, it is now stated management policy that it is the helpers' grades that are uneconomic to fill rather than the skilled grades. The emphasis at present is on the reduction in the ratio of helpers to journeymen, though the figures which have been examined are not indicative of this stated policy. As management states the case, helpers are uneconomic because of the narrow differential in rates of pay between helpers and skilled men, and the greater range of possible work which skilled men can be required to perform. That management might now choose not to employ helpers may

result not from changes in the character of the work at Angus, but from the reduction in the quantity of it. Up to the present time, however, the stated benefits from such a change in employment policy have not resulted in any concrete changes in the employment structure at Angus.

Moreover, in relation to the conclusion stated above and from which this discussion has stemmed, the issue of proposed changes in the employment structure is not completely relevant. What would be relevant would be the way in which management would handle the process of eliminating the helper grades and building up the craftsmen force in their place. Extensive revisions in work rules will be necessary irrespective of the appointment policy adopted, and extensive amendments will be necessary in the determination of craft qualifications, union acceptance of non-apprentice personnel into journeymen ranks on the basis of experience and qualification to do the range of jobs at Angus, and wide possibilities for training of helpers will be open. Possibly the technological changes at Angus have opened up the way for widespread changes in the qualifications necessary to perform the work there. These changes might in turn go some way towards explaining the narrowing of differentials and the possibility which is now occurring for raising the helper groups to skilled categories at the lowered differential job wage rate.

## Chapter 2

## Changes in the Skilled and Semi-skilled Composition of the Work Force in Maintenance of Equipment and their Implications for Employment Policy

The quantitative data in this chapter relate to the composition of maintenance of equipment employment at Weston and Ogden Shops at Winnipeg and Calgary respectively. These shops were chosen because comparable figures for earlier years were not available at Angus. It is hoped, however, that the changing ratios of skilled men and helpers will point to certain conclusions concerning the skill nature of maintenance work over time.

Again, it is necessary to qualify the conclusions to be drawn. First, the figures are distorted to the extent that they relate to the number of men in each seniority list who are working. Figures more relevant to our purposes would be those of men employed in each craft, irrespective of the seniority list to which they are permanently attached at the time. Second, to the extent that management has followed a deliberate policy of protecting older and long-service employees (as has been the case with respect to moulders and, according to management, to boilermakers), the change in skill composition is distorted. Third, as the numbers employed in the different groups diminish (as has been the case with most of the groups), the changes in the ratios become exaggerated. This is true also in any case where a group classification has no members. Fourth, it is almost certain that the average skill of the semi-skilled group as a whole has increased over time because of the growing average length of service of the semi-skilled group as the number employed has fallen. This would tend to lead to a reduction over the period in the ratio of skilled to semi-skilled numbers of employees, because of the greater capacity of the latter to work with less supervision than where a larger part of their numbers is inexperienced.

The figures for skilled and semi-skilled men employed at Weston and Ogden Shops since 1949 are shown in Table 37.

Bearing in mind the above-mentioned qualifications, the following points can be made from a study of the skilled, semi-skilled composition of maintenance work.

1. The stability of the ratio at 1:1 in the case of blacksmiths and car repairers to helpers, and at 2:1 in the case of machinists to helpers, is very suggestive of a technical or institutional rule to provide for fixed proportions in their employment (See Chart 3).

2. The replacement of machinists by electricians in the employment structure of equipment shops following dieselization has resulted in an increase in the skill composition of maintenance employees. This should not be interpreted as a statement on the relative skill of machinists and electricians. It simply means that relatively less work of a semi-skilled nature appears to exist in the repair of diesels in comparison with the steam locomotives.

Chart 4, showing the ratio of electricians to electricians' helpers, seems to suggest clearly that this is so. Moreover, the figures which appear in Table 37 (from which the charts are drawn) show the growth in numbers of electricians while the numbers of helpers have declined. The figures suggest that diesel maintenance requires that the employees engaged on it be qualified to perform the work involved independently.

TABLE 37

Skilled and Semi-Skilled Numbers Weston and Ogden Shop

(September of Each Year)

| Occupations | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Car Department | | | | | | | |
| Blacksmiths | 11 | 11 | 11 | 11 | 10 | 11 | 10 | 11 | 11 | 10 | 8 | 9 | 8 | 9 |
| Blacksmiths' helpers | 11 | 11 | 11 | 11 | 10 | 10 | 11 | 11 | 10 | 10 | 9 | 9 | 8 | 8 |
| Pipefitters | 19 | 18 | 18 | 19 | 23 | 11 | 19 | 24 | 23 | 19 | 20 | 19 | 15 | 16 |
| Pipefitters' helpers | 9 | 12 | 14 | 13 | 14 | 14 | 14 | 13 | 20 | 16 | 13 | 15 | 13 | 10 |
| Sheet-metal workers | 28 | 31 | 35 | 32 | 32 | 28 | 32 | 34 | 39 | 36 | 35 | 34 | 35 | 35 |
| Sheet-metal workers' helpers | 7 | 4 | 6 | 6 | 6 | 6 | 8 | 9 | 17 | 14 | 12 | 12 | 12 | 14 |
| Car Repairers | 175 | 129 | 173 | 161 | 151 | 185 | 258 | 281 | 228 | 231 | 191 | 167 | 161 | 131 |
| Car Repairers' helpers | 176 | 134 | 215 | 195 | 188 | 194 | 240 | 259 | 209 | 201 | 185 | 150 | 149 | 125 |
| | | | | | | | Locomotive Department | | | | | | | |
| Machinists | 561 | 550 | 629 | 624 | 614 | 417 | 449 | 517 | 395 | 369 | 322 | 272 | 287 | 254 |
| Machinists' helpers | 243 | 231 | 281 | 265 | 268 | 171 | 185 | 216 | 175 | 182 | 162 | 143 | 154 | 140 |
| Blacksmiths | 67 | 67 | 76 | 77 | 77 | 44 | 42 | 57 | 55 | 49 | 48 | 38 | 39 | 37 |
| Blacksmiths' helpers | 78 | 79 | 88 | 87 | 88 | 55 | 40 | 58 | 57 | 52 | 50 | 48 | 52 | 47 |
| Boilermakers | 124 | 113 | 126 | 121 | 129 | 61 | 58 | 98 | 56 | 45 | 41 | 31 | 40 | 33 |
| Boilermakers' helpers | 132 | 119 | 132 | 127 | 130 | 54 | 58 | 79 | 28 | 21 | 18 | 10 | 12 | 7 |
| Electricians | 30 | 33 | 38 | 39 | 41 | 41 | 38 | 61 | 74 | 72 | 73 | 58 | 67 | 67 |
| Electricians' helpers | 9 | 10 | 14 | 13 | 14 | 11 | 7 | 8 | 9 | 12 | 13 | 7 | 4 | 4 |
| Painters | 30 | 29 | 32 | 31 | 31 | 13 | 18 | 25 | 21 | 19 | 12 | 10 | 13 | 11 |
| Painters' helpers | — | — | — | — | — | — | — | — | 8 | 7 | 7 | 5 | 7 | 5 |
| Pipefitters | 52 | 53 | 60 | 58 | 57 | 34 | 43 | 50 | 33 | 31 | 28 | 17 | 21 | 19 |
| Pipefitters' helpers | 32 | 33 | 48 | 45 | 40 | 11 | 23 | 27 | 18 | 16 | 12 | 4 | 4 | 4 |
| Sheet-metal workers | 29 | 30 | 35 | 33 | 32 | 16 | 20 | 19 | 13 | 13 | 13 | 12 | 15 | 12 |
| Sheet-metal workers' helpers | 10 | 18 | 20 | 20 | 20 | 9 | 15 | 14 | 6 | 4 | 3 | 4 | 7 | 3 |

Chart 3

RATIOS OF BLACKSMITHS, CAR REPAIRERS AND MACHINISTS
TO THEIR RESPECTIVE HELPERS

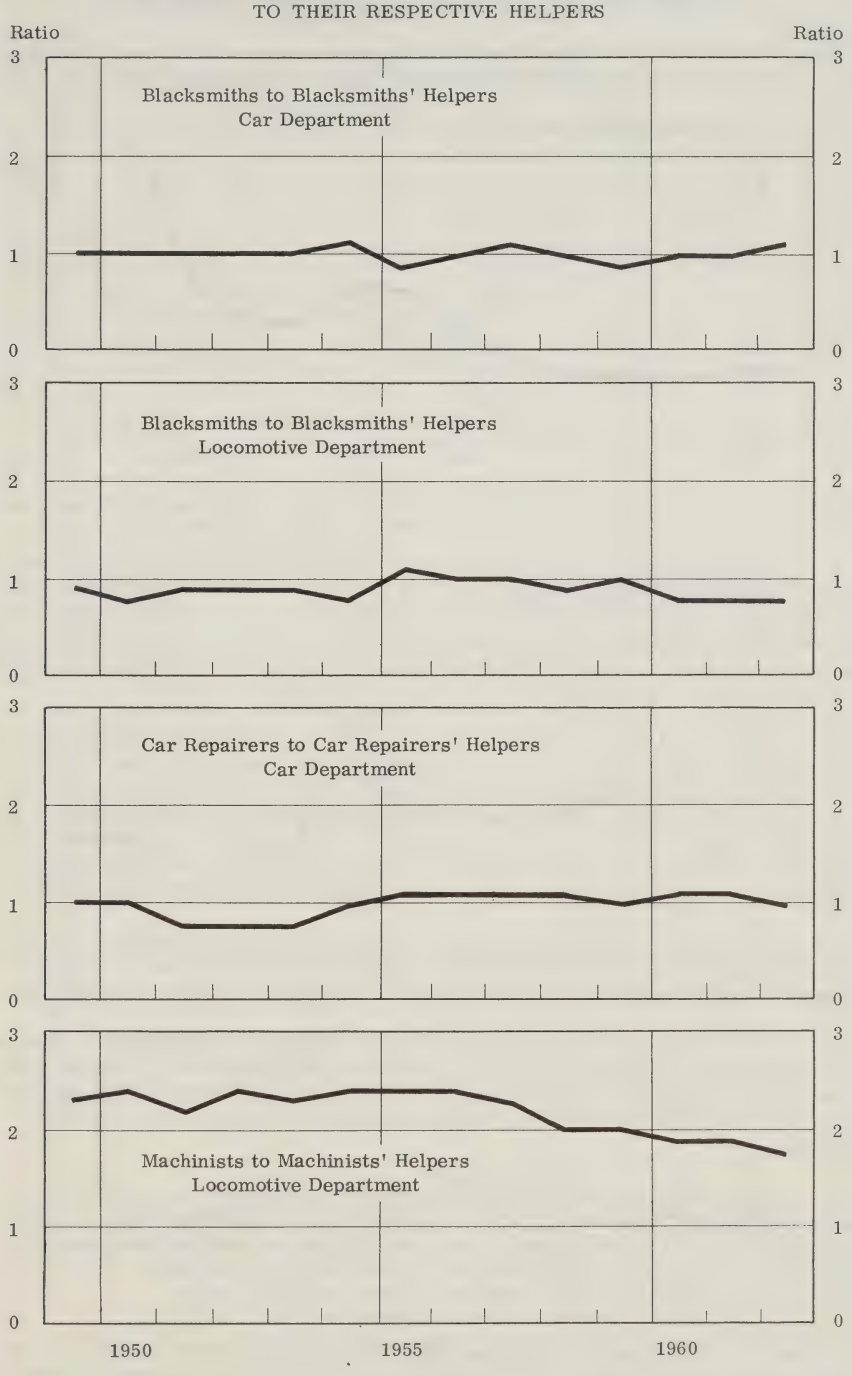
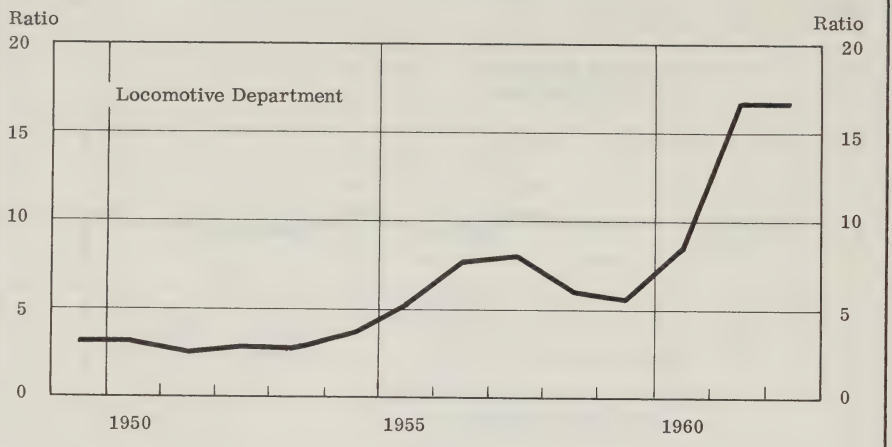


Chart 4

RATIO OF ELECTRICIANS' TO ELECTRICIANS' HELPERS




3. The ratios of pipefitters and sheet-metal workers to helpers in the Locomotive Departments at Weston and Ogden Shops have increased over the period.1/ Here again, unless management policy has begun to cut down the helper grades to increase the work variability potential of its employees, it would seem that the skill composition of locomotive maintenance work has increased with dieselization (See Chart 5).

4. Whatever may be the reason for the increasing ratio of skilled to semi-skilled men in the case of electricians and pipefitters, it would seem to be inadequate to explain the rise in the ratio of boilermakers to helpers in that craft. Management has declared that it has a policy of protecting older and long-service employees and that it has protected the boilermaker group on these grounds. This seems to be the only adequate explanation for the relative increase in their employment (See Chart 6).

5. The two instances of a reduction in the skill composition of the employment in a craft are those of painters in the (See Chart 7) Locomotive Department and of sheet-metal workers in the Car Department.

In both cases, the charts and the figures show how the work done by these groups is becoming less skilled and more capable of being performed by semi-skilled employees. In the case of painters, the employment of helpers has been introduced while the number of painters has been declining.

The fall in the ratio of sheet-metal workers to helpers is almost certainly traceable in part to the reduction in passenger traffic, to the advent of the stainless steel passenger car and to the development of electric air-conditioning and refrigeration, all of which have reduced skill content and the total work performed by this craft.

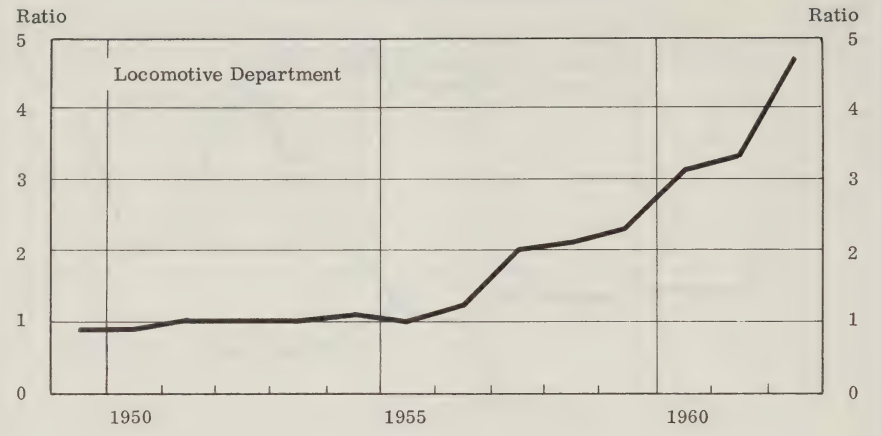
1/ In the case of electricians and pipefitters, the ratio of skilled to semi-skilled employees has increased more than the figures suggest. At Angus, the largest part of total temporary promotions comprises upward movements in these crafts. We can assume this to be true of Weston and Ogden Shops also.

Chart 5

RATIOS OF SHEET METAL WORKERS AND PIPEFITTERS TO THEIR RESPECTIVE HELPERS

Chart 6

RATIO OF BOILERMAKERS' TO BOILERMAKERS' HELPERS




Having seen the way in which these ratios of skilled men to helpers have varied over the period within the different craft groups, and between the groups, a question may now be posed regarding the possibility of managerial policy moving towards generally reducing the proportion of helpers in the different groups.

In favour of such a policy, the following arguments could be cited:

1. Given the narrowing wage differential, the change in the work potential of the semi-skilled in relation to the skilled employee has not been such as to equal the relative efficiency obtained by increasing the skilled component in the total quantity of labour employed.

2. The growth of overhead and administrative expenses which tend to vary with the volume of labour employed favours a smaller labour force with a higher skill composition that can produce the same output as a larger labour force with a lower skill composition.

3. The work content has changed so that now the greater part of it must be done by employees who can work independently of supervision, i.e., by qualified journeymen.

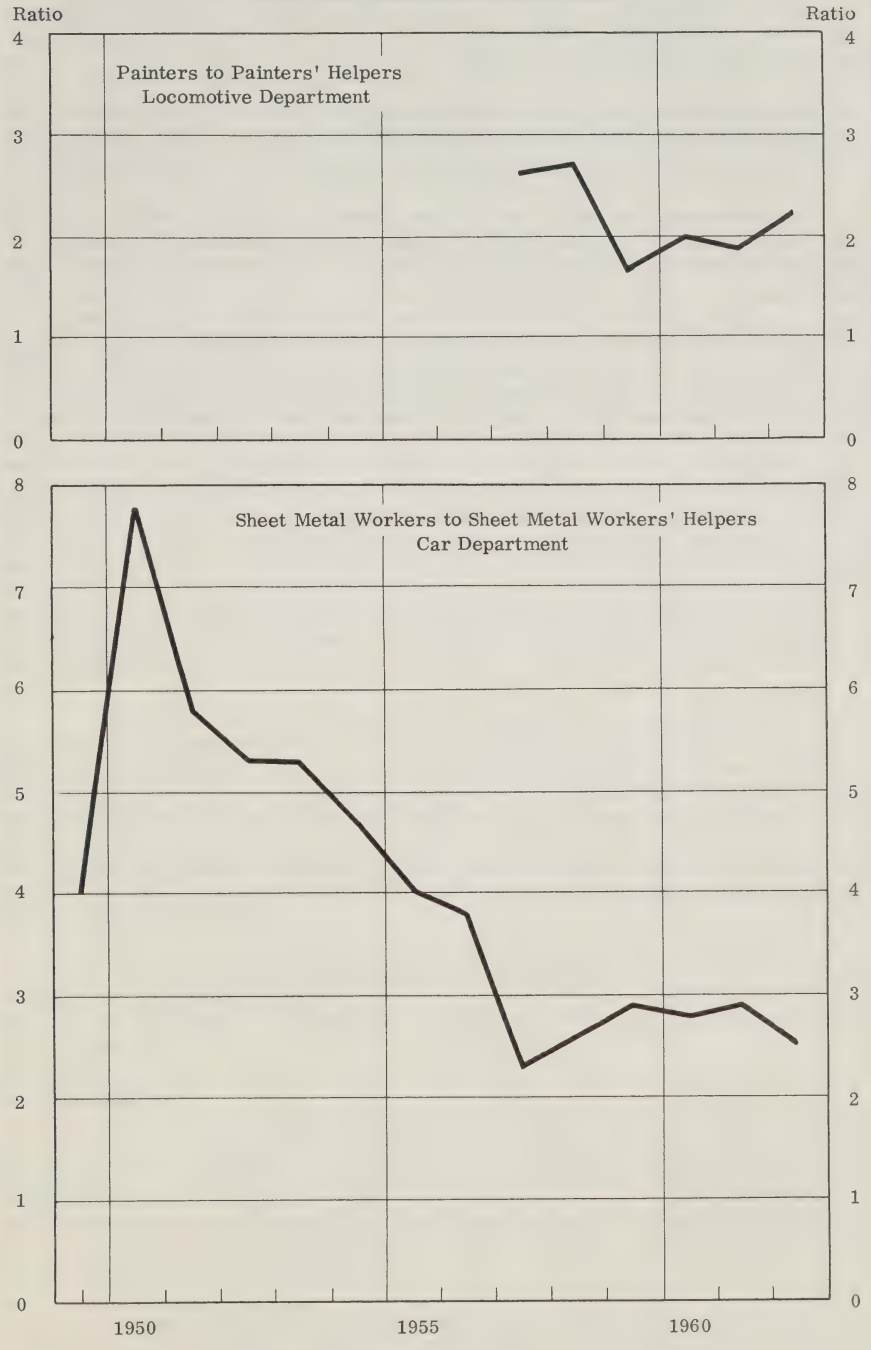
4. Possibly, the demarcation between skilled tradesmen and helpers should be reconsidered and revised. By definition, a helper cannot work alone, and this applies as well to jobs where less than full qualifications are required.

It could also be said that:

1. The elimination of the helper grade would establish a major break between the labourer and the skilled grades. This would not accurately reflect the degrees of difference in the jobs that have to be performed by each category.

Chart 7

RATIOS OF PAINTERS AND SHEET METAL WORKERS
TO THEIR RESPECTIVE HELPERS



2. In areas where traditional work patterns have kept ratios between skilled and semi-skilled workers constant despite considerable change in the work content, increased flexibility in the skill composition may prove a better method of adapting the work force than maintaining employee ratios. Such flexibility has already been shown to exist in many of the craft groups.

Although unable, because of insufficient familiarity with management policy to make an authoritative statement on this issue, the use of flexibility as described above would appear to be worthwhile.

This decision may already have been taken in certain areas in locomotive maintenance work, in the newer occupations and in those occupations where small numbers are employed. It would account for the almost complete absence of helpers in the electricians' trade, boilermakers', pipefitters' and sheet-metal workers' crafts. Intuitively, it would seem that the skill requirements for these trades are less in diesel maintenance than was the case in steam engine maintenance. The rising ratios suggest that this has been more than offset by the pressures favouring an increase in the skill content of the labour which is employed.

## Chapter 3

## The Layoff Experience of Selected Angus Boilermakers, 1953-1963

This chapter describes the experience of a particular group of Angus workers while on layoff. It was originally intended to make a far more searching and conclusive document which would analyze the experience of different craft groups, age groups, and groups of varying seniority lengths; however, time and lack of resources did not permit this. It may well be that the only really worthwhile conclusion to be derived from the very brief inquiry related below is that the study of technological or structural unemployment is far too wide a topic to allow any real conclusions to be drawn from the study of one small non-typical specialized group of workers.

There is no doubt that a study of the Greater Montreal area as a labour market is needed. It is necessary to know how workers find jobs, how boys decide on the skills they will acquire, what are the characteristics of commitment to a skill, who are the long-term unemployed, who find jobs easily without significant change in wage rates, who are the adaptable and easily absorbed, what is the significance of plant seniority arrangements on the mobility of labour between firms, what is involved from the workers' viewpoint in changing jobs and how often do men change their employers and their job types, what are the hiring practices of employers, what is the role of the National Employment Service as a factor in the mobility of labour, what role does the union play. It is doubtful if anyone today could answer more than one or two of these questions. Yet, there are reasonably reliable answers to all of them if the necessary resources for research are made available.

It might be asked why anyone should be concerned with such questions. The market solves all these questions, and solves them for the whole economy without using any statistical aggregation or averaging techniques. But there is another significant measurement beyond the concern for finding answers or with the fact that there are answers, and that is the quality of the answers. Concern with the issue of technological and structural change and their effect on employment is also a measure of the concern with the answers that the market economy is constantly in process of establishing.

These comments should be a sufficient indication of the limitations of the following study. It could have been expanded but only at the cost of limiting the study of the labour force adjustment process at Angus since 1948.

### The Interviewees

The group of employees chosen for the survey consisted of 19 boilermakers of varying ages, seniority lengths, marital and family status now employed at Angus who had experienced a layoff since January 1953. Boilermakers were chosen because they are a craft group which had unquestionably been affected by the technological changes at Angus since 1948. Moreover, they formed a group which could be interviewed in the limited time that was available.

The manageability of the group was accompanied, however, by a reduction in the conclusiveness of the study. In confining the study to currently employed boilermakers, contact was not made with the more mobile employees, those less committed to or less dependent on Angus for their

livelihood. These would not be in the group surveyed because they were working elsewhere, either at other CPR locations to which they had permanently transferred or with some other company. Over the period covered by the survey, 10 boilermakers resigned from Angus while working there and 42 boilermakers in all (including 32 who resigned while on layoff) resigned and were removed from the Angus seniority lists. Members of this group appear more frequently at the lower end of the Angus seniority list, indicating that the less the seniority, for these or other associated reasons, the less the degree of attachment to Angus.

There are four cases of Boilermakers with post-January 1953 seniority (See Appendix 8, Part II) date who avoided layoff throughout the period. Two of these were able to secure transfers to St. Luc and Windsor Station. They were also able to accumulate seniority at these points and consequent job protection over other more senior Angus employees later transferred to these points.

Omitting the experience of these employees from the survey results in a general exaggeration of immobility in the form of craft and plant attachment. The group interviewed tends to be older, have longer Angus service, and have more accumulated Angus seniority than a wider layoff survey would show. This means that their degree of success in finding a new permanent job in response to a given amount of effort would be less (the amount of effort and the intensity of the search for a new permanent job would tend to lessen both because of a smaller chance of success and a greater possibility of recall to Angus) than if those who were younger and whose chances of recall were less had been included.

The 19 persons interviewed provided a total of 52 layoffs. A partial breakdown of this layoff is shown in Appendix 9, Part II. The employees are ranked according to seniority in Table 38.

Table 38

Boilermakers at Angus Workshops - Selected List in Order of Seniority - Layoffs 1953-1963

| Employees | Year of Birth | Date of Seniority as Boilermaker | No. of Layoffs |
|---|---|---|---|
| $X_1$ | 1910 | April 12, 1933 | 1 |
| $X_2$ | 1910 | Oct. 3, 1933 | 1 |
| $X_3$ | 1910 | May 29, 1934 | 1 |
| $X_4$ | 1909 | Sept. 25, 1934 | 2 |
| $X_5$ | 1913 | Feb. 27, 1935 | 2 |
| $X_6$ | 1910 | June 15, 1935 | 2 |
| $X_7$ | 1911 | July 1, 1937 | 2 |
| $X_8$ | 1914 | Nov. 13, 1938 | 3 |
| $X_9$ | 1913 | Dec. 11, 1938 | 3 |
| $X_{10}$ | 1917 | June 14, 1940 | 3 |
| $X_{11}$ | 1918 | Sept. 12, 1940 | 4 |
| $X_{12}$ | 1917 | Oct. 7, 1940 | 4 |
| $X_{13}$ | 1900 | Oct. 22, 1940 | 3 |
| $X_{14}$ | 1917 | Dec. 21, 1940 | 3 |
| $X_{15}$ | 1917 | Jan. 29, 1941 | 4 |
| $X_{16}$ | 1922 | April 13, 1944 | 4 |
| $X_{17}$ | 1922 | Dec. 14, 1944 | 3 |
| $X_{18}$ | 1909 | Feb. 3, 1948 | 3 |
| $X_{19}$ | 1921 | June 13, 1955 | 4 |

There is no need to elaborate on the clear relationship which the Table shows between age, seniority and the number of layoffs experienced by these workers.

The Questionnaire

The questions asked are set out in Appendix 10, Part II. It will be noted that some are questions of fact, and of a type that could be answered by a 'Yes' or 'No' on the basis of actual experience. Some are hypothetical and postulate assumed situations. Given enough actual situations, hypothetical questions can also be made to have an actual basis, if only to establish consistency between the answers given; similarly, the posing of hypothetical questions of a different form can illustrate consistency or contradictoriness of answers in each hypothetical situation.

Once again, however, many desirable analytic features had to be sacrificed on the grounds of insufficient time and resources. It is hoped, however, that the few conclusions which follow will help to increase the knowledge of the factors impinging upon the problem of labour mobility in economic change.

In the analysis of layoff experiences, the layoff periods are divided into four categories. A period encompasses the time interval which lapses between the layoff of the junior man in the group and his return from layoff. This could be regarded as a precise definition which would lend accuracy to the periods, but it is not necessarily so. The senior men on layoff may take up jobs and opt not to accept a recall to Angus. This would constitute a recall to temporary work, but there may be no further layoff, so that it is, in effect, a recall to permanent work. Thus, junior men may return from layoff while senior men are still on layoff, and the layoff period would be shorter than if these exceptions were to be taken into account.

Appendix 9, Part II shows how the period division, which may be regarded as somewhat arbitrary, could be justified. Periods 1 and 2 can be set out clearly, whereas periods 3 and 4 overlap considerably, suggesting that several short periods would better describe the layoff process. Between October 1957 and June 1963 (the interval described by Periods 3 and 4), some men were on layoff on three separate occasions, while the junior men were on layoff over the whole period. However, to secure two full periods it is proposed to use the data of layoff experiences in Period 1, and to omit certain of the overlapping cases in Period 4. This gives two cycles, which appear to be clearly demarcated.

Analysis of Period 1.--Fifteen men were laid off in the cycle which appears to have started in mid-April 1954 and ended in end-May 1955. The longest layoff period was just over 13 months, the shortest just over four months.

The following is a summary of the layoff experience of the 15 men involved, in the appropriate order of seniority.

| Date of Birth | Family Status at Time of Layoff | Seniority Date | Duration of Layoff Months: Days | Layoff Experience |
|---|---|---|---|---|
| 1. 1909 | M, no children | 1934 | $4^{2}$ | Unemployed 2 weeks. Taken on by Montreal Locomotive Works as boilermaker. The bonus, incentive pay and overtime brought wages to equality with Angus earnings. |
| 2. 1913 | M, no children | 1935 | $4^{2}$ | Unemployed 6 weeks. Taken on by Allis-Chalmers Co. as boilermaker (assembler-plater). Rate of pay and earnings less than at Angus. Worked 2 weeks, then affected by strike of employees at Dominion Bridge. Laid off and was unemployed until recall to Angus January 1955. |
| 3. 1910 | - | 1935 | $4^{4}$ | No unemployment. Taken on by Canadian Vickers Company with no loss of time. Status--boilermaker helper at a rate less than that of boilermaker at Angus. |
| 4. 1911 | M, 1 child | 1937 | $4^{3}$ | Unemployed 3-4 days. Taken on by Air Ventilation Co. Laid off after $3\frac{1}{2}$ months. Rate of pay higher than receiving at Angus. Unemployed 2 weeks before recall to Angus. |
| 5. 1914 | M, 1 child | 1938 | $4^{24}$ | Unemployed whole period. |
| 6. 1913 | Widower, 4 children | 1938 | $4^{5}$ | Unemployed 2 weeks. Taken on by Allis-Chalmers Co. as work-plate fitter. Pay lower than Angus. Quit after 7 days to take job at Montreal Locomotive Works as boilermaker. Rate of pay less than Angus, but cost-of-living allowance and bonus brings earnings to equality with Angus. |
| 7. 1917 | M, no children | 1940 | $9^{1}$ | No unemployment. Taken on by Montreal Locomotive Works as a boilermaker. Rate of pay less than at Angus, but cost-of-living allowance and bonus brought earnings to greater than at Angus. |

| Date of Birth | Family Status at Time of Layoff | Seniority Date | Duration of Layoff Months: Days | Layoff Experience |
|---|---|---|---|---|
| 8. 1917 | - | 1940 | $5^{14}$ | No initial unemployment. Taken on by Canadian Betchel (Construction) Co. as boilermaker. Wage rate higher than Angus but work seasonal. Laid off and unemployed 1 week. Then taken on by Montreal Locomotive Works as steelworkers' helper. Earnings similar to Angus. Returned to Angus on recall. |
| 9. 1900 | - | 1940 | $5^{16}$ | Unemployed whole period. |
| 10. 1917 | S. | 1940 | $8^{7}$ | Unemployed for 1 month. Then taken on by Canadian Vickers Co. as boilermaker helper. Rate of pay less than at Angus. Quit with Canadian Vickers to go to Montreal Locomotive Works. Earning higher than at Angus. Returned to Angus on recall. |
| 11. 1917 | S. | 1941 | $8^{16}$ | Unemployed for whole period. |
| 12. 1922 | M, 3 children | 1944 | $12^{2}$ | Unemployed for $3\frac{1}{2}$ weeks. Taken on by A. Boievert Construction as plate and sheet-metal worker. Rate of pay less, longer hours and paid straight rate throughout. Worked till recall to Angus. |
| 13. 1922 | M, 3 children | 1944 | $12^{3}$ | On layoff from Angus, worked in a personal business as service-station operator. Took advantage of layoff to follow training course in "Service-Station Operation" by B.P. and Fina Companies. |
| 14. 1909 | M, 1 child | 1948 | $13^{10}$ | Unemployed whole period. |
| 15. 1921 | M, 2 children | 1955 | $13^{5}$ | Unemployed 2 days. Taken on by T. Eaton and Co. as service man on refrigerators. Resigned from Angus to get pension money to buy an automobile in order to keep the Eaton job. Pay was less than Angus but learning a new trade. Returned to Angus on recall. |

A summary of the actual layoff time is presented in Table 39. It is not possible to establish precisely the real measure of loss involved to the persons affected in the foregoing layoff period (Period 1). The issue of the seriousness of the unemployment impact on these 15 persons is left to those who have the specific duty of making assessments in this field of enquiry. It must be borne in mind that no attempt was made to check the accuracy of the statements.

Table 39

Unemployment Impact on Boilermakers at Angus Workshops - Summary of Period 1

| Employee Listing | Layoff Period from Angus Months: Days | Unemployed |
|---|---|---|
| 1 | $4^{2}$ | 2 weeks |
| 2 | $4^{2}$ | 6 weeks |
| 3 | $4^{4}$ | - |
| 4 | $4^{3}$ | $2\frac{1}{2}$ weeks |
| 5 | $4^{24}$ | $4^{24}$ months |
| 6 | $4^{5}$ | 2 weeks |
| 7 | $9^{1}$ | - |
| 8 | $5^{14}$ | 1 week |
| 9 | $5^{16}$ | $5^{16}$ months |
| 10 | $8^{7}$ | 4 weeks |
| 11 | $8^{16}$ | $8^{16}$ months |
| 12 | $12^{2}$ | $3\frac{1}{2}$ weeks |
| 13 | $12^{3}$ | - |
| 14 | $13^{10}$ | $13^{10}$ months |
| 15 | $13^{5}$ | 2 days |

Two points of interest emerge from the study of Period 1 experience:

1. Of the 15 men considered, four found no alternative employment throughout their layoff period. Of the four, two were the two oldest people in the group, although they were nine years apart in age, and another employee similar in age to the younger worked almost throughout the whole period.

2. Two of the 15 were single. One of these indicated that his status made it less necessary for him to look for work and he remained unemployed throughout his $8\frac{1}{2}$ months layoff. The other single person was concerned over being laid off and was able to secure employment after 1 month. An interesting sequel to the story of the first interviewee was that he married during the period identified as Period 4. He said, in recalling his layoff experience at that time, that "It makes a difference when a man is married"; so he found a job.

It may be significant that the two persons who were unemployed throughout the period and for the longest time (13 and 8 months, respectively) were the oldest persons in the group and a single person.

Analysis of Period 4.--In order to identify further tentative conclusions, an examination was made of the experiences of these same 15 persons during the Period 4 layoff. For all the boilermakers who were involved in this layoff, the period was longer - one over which it would have been impossible to maintain a household without some sort of paid occupation, serious depletion of savings or involvement in debt.

The same employee listing is used as in Period 1, so that the numbers used refer to the same persons. Four more employees were involved in the Period 4 layoff than in Period 1. It should be borne in mind that more employees would have been included in all the periods were it not for the confinement of the survey to those who were currently employed at Angus.

| Date of Birth | Family Status at Time of Layoff | Seniority Date | Duration of Layoff Months: Days | Layoff Experience |
|---|---|---|---|---|
| 1. 1909 | M, no children | 1934 | $9^{25}$ | Unemployed whole period. |
| 2. 1913 | M, no children | 1935 | $9^{25}$ | Unemployed for 6 months. Then taken on by Canadian Pacific Railway Express Co. as baggage attendant. Rate of pay considerably less than boilermaker rate at Angus. Laid off after 5 weeks. Remained unemployed until recalled to Angus 6 weeks later. |
| 3. 1910 | - | 1935 | $11^{15}$ | Taken on at St. Luc as boilermaker helper at time of layoff from Angus. Worked 3 weeks then laid off. Remained unemployed until recall to Angus, $10\frac{1}{2}$ months later. |
| 4. 1911 | M, 1 child | 1937 | $11^{9}$ | Unemployed 2-3 days. Then took job as janitor with CPR at Windsor Station for 1 month. Quit to take job as boilermaker at St. Luc over the summer vacation period. Laid off at St. Luc. Unemployed 2-3 days then taken on by Checkers Union as a spare stevedore. Laid off after $5\frac{1}{2}$ months and then unemployed for 1 month. Taken on by Checkers Union as a regular stevedore. Rate of pay higher than rate at Angus but returned to Angus on recall. |

| Date of Birth | Family Status at Time of Layoff | Seniority Date | Duration of Layoff Months: Days | Layoff Experience |
|---|---|---|---|---|
| 5. 1914 | M, no children | 1938 | $13^{12}$ | Taken on immediately by Canadian Vickers Company. Employed as fitter, lower rate of pay than at Angus, but earnings similar because longer hours worked. Contract ended but was transferred inside Canadian Vickers to work as sheet-metal worker. Total employment $3^{17}$ months. Laid off and unemployed for 2 weeks. Recalled by Canadian Vickers and worked as fitter for 3 months. Laid off and unemployed for 7 months until recalled to Angus. |
| 6. 1913 | M, 1 child | 1938 | $13^{11}$ | Taken on immediately by Canadian Vickers Company as assembler-plater. Employed on night work, and though basic pay rate less than at Angus, night shift rate made earnings similar to Angus. Total employment $11^{18}$ months. Laid off and unemployed for $1^{17}$ months until recalled to Angus. |
| 7. 1917 | M, no children | 1940 | $13^{23}$ | Taken on by Peerless Clothing Co. on shipping and receiving work. Rate of pay lower than at Angus. Remained in employment there until recalled to Angus. |
| 8. 1917 | - | 1940 | $4^{15}$ | Unemployed 2-3 days. During layoff from Angus worked with CPR Express as porter, with Attwood Construction Co. as bricklayer in boiler installing, and at St. Luc as boilermaker helper. Returned to Angus on recall as helper in Bridge and Building Department. |
| | | | $3^{28}$ | Unemployed $1^{10}$ months. Taken on by CNR as boilermaker and remained there till recall to Angus. |
| 9. 1900 | - | 1940 | $24^{9}$ | Unemployed 2 months. Taken on at St. Luc as boilermaker for 8 months until laid off. Unemployed 7 months. Them employed as watchman by Verdun Yacht Club. Rate of pay less than at Angus, on call 24 hours, and nights spent at the Club. Remained there 7 months until recalled to Angus. |

| Date of Birth | Family Status at Time of Layoff | Seniority Date | Duration of Layoff Months: Days | Layoff Experience |
|---|---|---|---|---|
| 10. 1917 | S. | 1940 | $27^{9}$ | Unemployed for 11 months. Then taken on by J.A. Falconbridge Co. (Construction) as labourer. Laid off after 6 months. Unemployed for 1 month. Then taken on at CPR Glen Yard as linen handler and janitor. Employed for 9 months then laid off. Unemployed for 1 month until recalled to Angus. |
| 11. 1917 | M, no children | 1941 | $49^{1}$ | Unemployed 3 months. Taken on by Terry Machine Co. as sheet-metal worker. Rate of pay considerably less than boiler-maker at Angus. Quit after 12 months to take job with CNR as boilermaker. Remained with CNR 34 months until recalled to Angus. |
| 12. 1922 | M, 3 children | 1944 | $16^{11}$ | Unemployed 1 month. Taken on by A. Boievert Construction Co. Rate of pay less than at Angus but hours of work longer. Quit to take job with City of Montreal as helper blacksmith, then welder. Remained there till recall to Angus as bridgeman first year. Same rate of pay as with City of Montreal but better working conditions at Angus. |
| | | | $24^{17}$ | Unemployed 1 month. Then taken on by A. Boievert Construction Co. Remained with that Company until recalled to Angus. |
| 13. 1922 | M, 3 children | 1944 | $51^{2}$ | Unemployed 10 months. Then taken on at CPR Montreal Terminus as welder. Rate of pay less than for boilermaker at Angus. Employed for 2 months. Laid off and started work with CNR as boilermaker. Employed for 6 months. Quit to take up personal business as Fina Service Station operator. Returned to Angus on recall. |
| 14. 1909 | M, 1 child | 1948 | $53^{18}$ | Unemployed 4 months. Taken on by Masonic Temple as cleaner. Quit to take job at Rosemount School as cleaner; rate of pay higher than with Temple. Worked at School until recalled to Angus. |

| Date of Birth | Family Status at Time of Layoff | Seniority Date | Duration of Layoff Months: Days | Layoff Experience |
|---|---|---|---|---|
| 15. 1921 | M, 2 children | 1955 | $65^{28}$ | Unemployed for the whole period. However, used earlier training in air-conditioner and refrigerator repair to do odd jobs throughout the period, until recalled to Angus. (Note: The technique adopted in this survey was of little practical value in this particular case.) |

Table 40 summarizes this layoff experience in terms of the period of unemployment by the individuals concerned.

Table 40

Unemployment Impact on Boilermakers at Angus Workshops - Summary of Period 4

| Employee Listing | Duration of Layoff Months: Days | Unemployed |
|---|---|---|
| 1 | $9^{25}$ | $9^{25}$ months |
| 2 | $9^{25}$ | $7\frac{1}{2}$ months |
| 3 | $11^{15}$ | $10^{21}$ months |
| 4 | $11^{9}$ | $1^{10}$ month |
| 5 | $13^{12}$ | $7^{14}$ months |
| 6 | $13^{11}$ | $1^{17}$ month |
| 7 | $13^{23}$ | - |
| 8 | $4^{15}$ | 3 days |
| | $3^{28}$ | $1^{10}$ month |
| 9 | $24^{9}$ | 9 months |
| 10 | $27^{9}$ | 13 months |
| 11 | $49^{1}$ | 3 months |
| 12 | $16^{11}$ | 1 month |
| | $24^{17}$ | 1 month |
| 13 | $51^{2}$ | 10 months |
| 14 | $53^{18}$ | 4 months |
| 15 | $65^{28}$ | $65^{28}$ months (but seems to be a casual worker) |

Before turning to a comparison of the two experience statements, a few points may be made concerning the 1958 to 1963 layoff period (i.e., Period 4).

1. Of the 15 men involved, two were unable to (or did not) find any employment throughout their period of layoff. It may be significant that one of these is shown as the most senior in the layoff list (though there were three more senior than this man on layoff at the time--see Appendix 9,

Part II) and the other is the least senior on the list. However, the latter could be regarded as being only a casual worker in view of his outside interests and income opportunities.

In this layoff period, it will be noticed that there is a preponderance of unemployment incidence at the senior levels. This may indicate that these persons expected recall in view of their seniority and did not make such active attempts to secure alternative employment as did the less senior employees. This statement is made with reservation in view of: 1) the fact that in Period 1 all of these employees (listed 1 to 5) were unemployed for only short periods and worked for most of their layoff period, and 2) one employee worked as a baggage attendant--indicating a willingness to take on other than craft work.

2. Examining the experience of those men who were unemployed for $1\frac{1}{2}$ months or less, it will be seen that three of the four found work in industries where metal work was an incidental rather than a main feature. An interesting aspect of the employment mechanism in such cases is the essentiality of contacts in these companies--either relatives or friends. The following statements were made in answer to the question as to how entry into these non-metal industries was gained:

Employee 7

"The general manager of the (---) company and I are members of the same club."

"The owner of the (---) company and I bowl on the same team."

In Periods 1 and 4 this person was employed throughout the whole layoff period.

Employee 4

"I had attended a course at McGill University on advanced process of welding and metallurgy. There were supervisors there from different companies and so I had contacts."

Employee 8

"My brother worked for the (---) company and he told me about their vacancy for a bricklayer in boiler installation."

Employee 12

"The first time I found a job with the (---) company it was important that my brother was employed there since, otherwise, I would not have known about the vacancy. But then I qualified myself and was able to go ahead on my own when I was laid off the second time."

The information is too scanty to draw any significant conclusions from the experience of these 4 men. This inter-industrial transfer is a haphazard, random process of job movement. Usually it is a process where the union, which acts as an information centre on jobs within the craft, is an insufficient medium. Moreover, the UIC does not play any role in allocating these jobs. However, on the basis of the limited information available it is evident that this kind of transfer greatly increases the job opportunities for those who have access to them. Had it been possible to question the 42 boilermakers (32 from layoff) who resigned from Angus

over the period covered by the study, it is probable that this conclusion would be empirically strengthened. This is probable for another, intuitive reason than the widening of job possibilities involved in inter-industrial movements, namely, that resignation from one job is usually necessary for acceptance into regular employment with another employer--especially the smaller scale employers engaged in construction.

When the two layoff periods are compared, the pathos of the situation, despite the limitations of the information sample, becomes very evident. Comparison of the two periods do, however, show that personal characteristics are almost marginal to the job securing mechanism. The most senior men may expect early recall and are more likely not to look actively for work, and less likely to take jobs that pay significantly less than those to which they are accustomed. The older men hold out against any job which is not in their trade; but, as optimism lessens, they gravitate towards long-term employment as unskilled workers. In the only examples which can be offered from the sample, the oldest member firmly stated that he would not, under any circumstances, take a job as a labourer. However, during the Period 4 layoff, following 7 months' unemployment he took employment as a club watchman, on call 24 hours and spending his nights at the Club. The second oldest member said that, during his first layoff, he had held out against working as a labourer. However, in the Period 4 layoff he indicated that he would take work as a labourer and, during this layoff, took work for over 4 years as cleaner and janitor.

The statement that personal characteristics are not a determining factor in the employment process at this level, stems from the lack of similarity in the experience of the individuals in Periods 1 and 4. In general, the numerical smallness of the sample (which showed a consistent experience in the two periods) does illustrate the random qualities of the employment process.

But certain points are revealed by taking exception to this statement. Older people do gravitate into unskilled work; the men who possess alternative skill or training do have an advantage in mobility; and the usefulness of the 'contact' in facilitating inter-industrial transfer illustrates a real need for a more active institutional device for this purpose.

The question of the difference between the two periods, in terms of the general business conditions prevailing at the different times, has not been raised. However, a brief scrutiny of the data will show why experience at the beginning of layoff for the 15 interviewees would not yield conclusive results.

In Period 1, many of the 15 boilermakers were experiencing their first layoff ever, some their first layoff since the thirties. Thus, it would be expected that the process of job finding would be easier in Period 4 than in Period 1. The cycle downwards in Period 1 laid off 15 interviewees between April 24 and September 1, 1954. However, the layoff process in Period 4 was much more extensive, taking in the 15 interviewees over a period from the end of October, 1957 to May 13, 1960. Comparison of the initial unemployment on layoff between the two periods would not give any sensible conslusions. Use of Period 1 and Period 3 data would again be inconclusive. In Period 3, nine of the interviewees experienced layoff between October 28 and November 22, 1957. But to compare initial layoff here would render the conclusions questionable on the grounds of a failure to isolate the cause of such layoff from seasonality effects.

That it would not appear to be logical to make a comparison on the basis of the available data, should not be interpreted as meaning that this omission is not regarded as important. In a recent book published by the W.E. Upjohn Institute for Employment Research (Kalamazoo, Michigan), Dr. William Haber emphasizes the importance of the growth rate in the economy generally in determining the rate of reabsorption of workers displaced by technological or other structural change. There is no apparent reason to believe that this would not be true for the Angus boilermakers. But it cannot be shown to be true from the limited data assembled here.

Another extremely interesting question which cannot be answered from the data is the reason why (out of the 15 interviewees) 10 found only temporary and irregular work during their layoff from Angus. The five who found regular employment did so in occupations completely different from their own craft--even in industries not associated with metal work. It is necessary to know why a displaced worker in one industry cannot get similar and regular work in the same trade in another industry. To understand this, it would be necessary to interview boilermakers other than those who displayed an attachment to Angus, in that they returned on recall. It is not known whether or not these men really tried to find regular employment elsewhere. Another 32 boilermakers from Angus resigned while on layoff. Did they find regular employment? Many of them had little seniority and little pension equity in Angus. In this case, were they themselves displaced from some other industry and obtained only temporary work at Angus? But there were several with long service at Angus in this group of 32 boilermakers. Did they find regular employment outside?

The limits of time and resources available for this study reinforce the view that the examination of the 15 interviewees leaves many implications unanswered, has raised more questions than it has answered, and has set out only tentative evidence in support of the conclusions which have been drawn from the data.

## Summary of Part II and General Findings

Part II of the report is concerned with the labour force adjustment process at Angus Work Shops over the period 1948 to 1961. The adjustment process was examined first in terms of employment changes, turnover rates, layoffs and recalls, and resignation and retirement rates; and secondly in terms of the movement of labour within the plant itself.

1. Employment Changes

In looking at employment changes by broad groups, several things stand out. The greatest absolute decline in employment was in the skilled group, followed by the semi-skilled and unskilled classes. In percentage terms, the semi-skilled experienced the largest decline.

As a proportion of total employment, skilled workers increased slightly over the period and still formed the largest group. The proportion of semi-skilled workers declined more than any other group, but maintained their position as the second largest group. The proportion of clerical workers more than doubled over the period.

The ratio of skilled to semi-skilled has increased substantially. Together, these two groups made up over 80 per cent of total Angus employment in 1961, and it is clear that, within this consolidated group, the level of skill has gone up.

2. Turnover of Staff

The annual rates of turnover of staff (accessions plus separations) show very wide variations as between different occupations.

Skilled workers as a group experienced a relatively low turnover rate, which was well below that for helpers (semi-skilled) or labourers (unskilled).

Seasonality of employment was a major factor in the high turnover rate for carmen, sheet-metal workers, painters, upholsterers and seamstresses.

The high average turnover rate of moulders was due almost entirely to the closing of the Wheel Foundry.

The lowest turnover rate was experienced by blacksmiths, machinists, pipefitters, electricians and boilermakers in that order.

Decrease in Turnover Rates.--It is significant that the rates of turnover have been decreasing for most of the occupational groups over the period 1953 to 1962.

Trend lines of turnover rates were computed for a number of occupations and the study indicates that these provide an important way of determining occupational scarcities before they actually occur.

The study shows that by extrapolating these trend lines, the year can be arrived at where an equilibrium will be reached between hirings and separations. In the case of carmen, for example, the trend line indicates that this state of balance will be attained in the period 1968 to 1969. This suggests that the employment of carmen will become stable in this period. The wastage rate (covering separations for all causes) will then be the sole source of carmen vacancies, and the carmen on layoff at that time can expect to be absorbed into permanent staff at a rate equal to the rate of wastage.

Information of this kind is most significant and would clearly be helpful in indicating to railway employees the potential security of their jobs and in providing guidance to those concerned with retraining as to whether the probability of re-absorption of laid-off workers in their own trades lessens or intensifies the need for retraining.

Inter-correlation of Turnover Rates.--The rates of turnover for the different occupational groups at Angus show a high degree of inter-correlation. This would indicate that the main factors influencing the turnover rates are those internal to the work shop.

3. Layoffs

Layoffs accounted for a very large percentage of total separations at Angus over the period studied. Between 1953 and 1962, the proportion was 87.3 per cent for skilled employees; 81.3 per cent for semi-skilled employees; 79.3 per cent for unskilled workers; and 6.4 per cent for clerical and supervisory personnel.

The reduction in staff at Angus has been of such size that lay-offs have also been experienced by some of the long-service employees.

Some idea of this can be had from what happened to boilermakers. Over the period 1953 to 1963, one half of the boilermakers, who were employed at Angus in January 1953, and who were still employed in June 1963 experienced a total layoff period of five and a half months at one time or another.

With respect to other trades, the experience of machinists was somewhat similar to that of boilermakers. Moulders and upholsterers were undoubtedly even more deeply affected than these groups, whereas pipe-fitters, blacksmiths and electricians were less affected in terms of layoff of long-service employees.

A further illustration of the impact of layoffs on long-service employees can be had by looking at the experience of employees on layoff as of December 1, 1962. For example, the great majority of carmen had between 9 and 11 years' service; carmen helpers, between 10 and 11 years; sheet-metal workers, 10 to 13 years; and painters, 9 to 11 years.

A detailed analysis of the layoff experience of a selected group of boilermakers for the period 1953-63 is presented in Chapter 4 of the report. This group was chosen for study because they were a craft group which had been unquestionably affected by the technological changes at Angus since 1948. In addition, they formed a group which could be interviewed in the limited time that was available for this phase of the study.

4. Re-employment of Staff on Layoff

The recall of workers on layoff accounted for a very large proportion of total accessions at Angus. Between 1953 to 1962, the proportion was 90.4 per cent for skilled employees; 83.5 per cent for semi-skilled employees; and 78.6 per cent for unskilled employees.

Over the period 1957-62, the data show that vacancies arising at the different skill levels were largely filled by recalling those on layoff. This would indicate that the opportunity for retraining redundant workers for intra-plant movement was negligible.

The data also show that the size of the redundant staff has been consistently greater than the rate of wastage. There are indications, however, that this situation is changing. Evidence of this is that for

all groups, the rate of transfers into Angus from outside points has been increasing as a percentage of Angus accessions and the proportion of restarts has been decreasing. Also, in several occupations scarcities of manpower are evident, indicating that the number of men on layoff and on transfer is approaching zero in these instances.

It would appear then that the excess supply of labour at Angus is approaching manageable proportions, and such a situation has important implications, as will be further discussed below, for possible action by management and unions respecting measures which will enhance employment security and the mobility of workers.

5. Resignation Rates

Resignation rates tend to be lower and more stable the greater the level of skill. During the period 1953-61, the average rates of resignation for the broad groups were as follows: skilled, 1.3 per cent; semi-skilled, 2.8 per cent; unskilled, 4.1 per cent.

These figures would seem to indicate that, on balance, skilled workers are more willing and anxious to hold on to their jobs than unskilled workers, or perhaps even more important are given a greater incentive by management to do so. There is also some justification for the belief that at Angus the response of skilled workers to a change in the pattern of economic security is less than the response of the unskilled workers. This would seem contrary to what one would expect, because the greater the degree of skill a person has, the greater would tend to be the alternative sources of available employment and the greater the possibility of movement. The relative effects on resignation rates of ability and willingness to move and management employment policy with respect to the different skill groups would require a more detailed study than is possible with the data available in this report.

6. Retirement Rates

Two broad findings emerge from the study regarding retirement rates. First, rates of retirement for the skilled and semi-skilled groups have increased over the period 1953-61; second, rates of retirement tend to be higher the greater the level of skill.

The rising average age of staff as a consequence of employment reductions is an important factor in the rising retirement rates for skilled and semi-skilled workers.

The rates of retirement for the unskilled group have not risen over the period. One of the reasons for this may be that the effect of employment reductions on the age composition of this group was much less pronounced than in the case of the skilled and semi-skilled categories. This might be accounted for, in part, by the lesser degree of attachment of unskilled labour at Angus during periods of employment instability.

7. Intra-Plant Mobility

Temporary Transfers.--The study brings out two important conclusions concerning temporary intra-plant transfers:

1) the amount of temporary transfers which has been possible as an offset to layoffs in the different seniority groups has been negligible;

2) to the extent that temporary transfers have taken place at Angus, they have consisted mainly of promotions on a temporary basis of helpers to journeymen in their own crafts.

The study notes that a large part of the helper group promoted to journeyman status in a craft is qualified by experience to assume work at that level. Since they are not required to display full capability over all the jobs falling within the jurisdiction of the journeyman's trade, the amount of training required to perform the designated tasks is minimal.

There is a high degree of interchangeability of helpers as between the different crafts, but this has provided little protection against the layoff pressure within the helper group.

The fact that none of the employees working out of their craft were downgraded illustrates the job protectiveness of the seniority arrangements.

There was a complete absence at the skilled level of shifts on a temporary basis between crafts. Job differences between scarce and abundant crafts and the ability of experienced helpers to perform at the journeyman level in a trade help to explain this lack of movement.

The main determinant of temporary transfers has been scarcity in crafts. Management's response to this has been to fill such vacancies by upgrading of helpers. The reasons for this have been that,

1) management preferred to use labour resources already employed at Angus or on the Angus roll rather than resort to drawing in new employees;

2) seniority rulings and layoffs in almost all groups up to 1961-62 made it impossible to adopt any effective policy of internal transfer to absorb redundant workers; and

3) the helper grades are able to perform skilled work up to certain limits.

Significantly, it is now stated management policy that it is the helpers' grades that are uneconomic to fill, rather than the skilled grades, because of the narrow differential in rates of pay between helpers and skilled men and the greater range of work which skilled men can perform.

Permanent Transfers.--Some idea of the extent to which permanent transfers of helpers to journeymen positions has taken place at Angus is also provided in the study. Over the period January 1948 to January 1963, there were 208 such transfers and the majority of these (125 or 60 per cent) were in the carmen group. The number of permanent transfers for some of the other skilled groups were as follows:

| | |
|---|---|
| Painters | - 23 |
| Pipefitters | - 16 |
| Welders | - 11 |
| Carpenters (B. and B. Department) | - 10 |
| Electricians | - 9. |

In the remaining skilled categories there were very few permanent transfers or none at all.

8. General Findings

Two main conclusions seem to arise from the study of the adjustment process. First, there has been a very major reduction in employment at Angus over the post-war period. Not all groups have been similarly affected, but only in the case of electricians has the number of employees increased during this period. Generally, there have been men on layoff in all seniority groups, at least since 1952.

This ubiquity of redundancy has heavily influenced all the turnover rates that were derived. Layoffs dominated the movement of labour from Angus and the re-employment of workers on layoff dominated total accessions.

The second conclusion is that the rate of redundancy is decreasing, as are the turnover rates for all groups. There is evidence also that the incidence of seasonality on employment at Angus is decreasing because of the declining importance of passenger car repair work in the total work performed.

This tendency towards greater stability in employment at Angus was held to be basic to constructive discussions between management and unions concerning the adjustment process.

On the basis of the possibly bold assumption that trends in the stabilization process will continue, regressions were derived to estimate the period when turnover rates for separate crafts would equal normal wastage rates and replacements. It would be useful to predict this accurately for all occupations.

In the final analysis, future employment at Angus and in the railway industry generally will depend on the interaction of a number of factors which affect the demand for rail services. Factors that can stimulate demand include not only technological and organizational changes which increase the productivity of capital and labour, but also market research to keep in close touch with consumer needs, and pricing policies which are competitive with other modes of transportation and which are in line with long-run marginal costs.

Even though the possibility of further spectacular improvements and techniques comparable to those of the diesel may not be great, as some experts feel, innovations in equipment and the willingness to use them nevertheless do exist and will continue to exist. Given the present state of technology in the railway industry and the prospect of further innovations, whether employment falls further, remains constant, or even increases will depend ultimately on the level of output achieved. If output remains constant, there will almost certainly be a continuing reduction in the numbers employed at Angus.

The most that can be done at this stage of the enquiry is to speak of trends in general terms. It is fairly impossible to forecast trends correctly, and even more so to predict cyclical movements. The estimates of turnover rates presented in the study, even though they do not take into account cyclical movements, emphasize the fact that, in the absence of major technological break-throughs, employment stability can be predicted at Angus for employees who are not cyclical accessions. To the extent that the railways adapt to the ever-changing output requirements, that they are equally aggressive as competitors, and given a favourable economic framework, their output and the degree of employment security they can offer to more employees will be increased.

Within Angus, the stability in turnover rates opens up avenues for fruitful discussion between management and unions of desirable changes in apprenticeship programs, in widening of seniority lists, and of upgrading semi-skilled personnel. It is only by continuing discussion and constant re-evaluation of objectives that institutional arrangements can be adapted, as necessary, to facilitate the adjustment process. The job stability which was shown to be coming about at Angus enhances the opportunities presented to all parties concerned to engage in such a re-evaluation.

# APPENDICES

# TO

# PART II

## APPENDIX 1

Number of Employees in Each Occupation, Angus workshops 1948–1961

| | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Skilled | | | | | | | | | | | | | | |
| Machinists | 984 | 1,031 | 942 | 941 | 1,056 | 1,020 | 817 | 862 | 920 | 840 | 724 | 641 | 570 | 542 |
| Blacksmiths | 85 | 76 | 72 | 70 | 88 | 85 | 61 | 69 | 77 | 64 | 48 | 43 | 36 | 32 |
| Boilermakers | 204 | 201 | 161 | 159 | 164 | 158 | 101 | 115 | 117 | 68 | 53 | 54 | 37 | 35 |
| Sheet-metal workers | 165 | 212 | 211 | 220 | 299 | 257 | 189 | 199 | 175 | 168 | 111 | 128 | 100 | 86 |
| Electricians | 140 | 170 | 173 | 189 | 229 | 215 | 168 | 192 | 220 | 207 | 209 | 187 | 149 | 161 |
| Carmen | 1,153 | 1,280 | 1,332 | 1,562 | 1,885 | 1,760 | 1,218 | 942 | 1,286 | 1,175 | 910 | 806 | 708 | 657 |
| Pipefitters | 154 | 160 | 154 | 184 | 201 | 207 | 144 | 156 | 157 | 134 | 126 | 112 | 92 | 96 |
| Moulders | 38 | 38 | 34 | 35 | 36 | 36 | 29 | 31 | 33 | 28 | 21 | 23 | 13 | 5 |
| Painters | 225 | 242 | 237 | 286 | 318 | 305 | 228 | 227 | 205 | 193 | 161 | 139 | 114 | 108 |
| Upholsterers | 58 | 67 | 61 | 88 | 69 | 69 | 53 | 55 | 35 | 35 | 46 | 34 | 21 | 31 |
| Seamstresses | 11 | 12 | 10 | 11 | 9 | 9 | 7 | 8 | 6 | 5 | 6 | 5 | 3 | 4 |
| Total | 3,217 | 3,489 | 3,387 | 3,745 | 4,354 | 4,121 | 3,015 | 2,856 | 3,231 | 2,917 | 2,415 | 2,172 | 1,843 | 1,757 |
| Helpers | 1,472 | 1,550 | 1,476 | 1,582 | 1,948 | 1,809 | 1,293 | 1,371 | 1,367 | 1,189 | 1,095 | 973 | 813 | 799 |
| Labourers | 893 | 945 | 925 | 984 | 1,088 | 1,094 | 813 | 827 | 893 | 847 | 772 | 762 | 618 | 566 |
| Apprentices | 300 | 311 | 260 | 271 | 331 | 327 | 250 | 214 | 183 | 144 | 136 | 146 | 130 | 114 |
| Boys | 11 | 12 | 12 | 12 | 12 | 12 | 11 | 9 | 8 | 8 | 8 | 6 | 4 | 5 |
| Clerks | 80 | 103 | 104 | 103 | 102 | 102 | 97 | 93 | 93 | 91 | 96 | 95 | 96 | 94 |
| Foremen | 134 | 173 | 170 | 190 | 217 | 210 | 181 | 177 | 171 | 169 | 164 | 159 | 139 | 131 |
| Miscellaneous | | | | | | | | | | | | | | |
| Engineers | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Firemen | 24 | 22 | 21 | 22 | 24 | 32 | 19 | 18 | 22 | 22 | 18 | 19 | 18 | 16 |
| Yardmen | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 19 | 17 |
| Bricklayers ) | | | | | | | | | | | | | | |
| Gardeners ) | 15 | 15 | 15 | 16 | 19 | 18 | 15 | 15 | 17 | 13 | 14 | 14 | 12 | 10 |
| Charwomen ) | | | | | | | | | | | | | | |
| Total | 67 | 65 | 64 | 66 | 71 | 78 | 62 | 62 | 67 | 63 | 60 | 61 | 56 | 50 |
| TOTAL | 6,174 | 6,648 | 6,398 | 7,053 | 8,123 | 7,753 | 5,722 | 5,608 | 6,013 | 5,428 | 4,746 | 4,374 | 3,699 | 3,446 |

Notes: Figures corrected for inclusion of Miscellaneous.
Correction by addition of average in each occupation included in Miscellaneous category December 1948 and December 1961.
The figures of total employment are annual averages of month end employment at Angus workshop.

APPENDIX 2

Breakdown of Accessions by Skill Groups, 1953–1962

| | 1953 | | 1954 | | 1955 | | 1956 | | 1957 | | 1958 | | 1959 | | 1960 | | 1961 | | 1962 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % |
| Skilled | | | | | | | | | | | | | | | | | | | | |
| Restarted from ROS* | 1,043 | 75.3 | 990 | 98.5 | 670 | 88.5 | 442 | 88.4 | 551 | 96.0 | 177 | 94.1 | 490 | 97.0 | 291 | 95.1 | 398 | 88.8 | 233 | 82.0 |
| Hired | 335 | 24.2 | 1 | 0.1 | 69 | 9.1 | 52 | 10.4 | 21 | 3.7 | 8 | 4.3 | 1 | 0.2 | – | | 1 | 0.2 | 6 | 2.1 |
| Transferred in | 7 | 0.5 | 14 | 1.4 | 18 | 2.4 | 6 | 1.2 | 2 | 0.3 | 3 | 1.6 | 14 | 2.8 | 15 | 4.9 | 49 | 10.9 | 45 | 15.8 |
| Total | 1,385 | 100.0 | 1,005 | 100.0 | 757 | 100.0 | 500 | 100.0 | 574 | 100.0 | 188 | 100.0 | 505 | 100.0 | 306 | 100.0 | 448 | 99.9 | 284 | 99.9 |
| **Semi-Skilled (helpers only) | | | | | | | | | | | | | | | | | | | | |
| Restarted from ROS | 464 | 75.9 | 314 | 96.6 | 236 | 57.6 | 107 | 68.6 | 229 | 94.2 | 53 | 93.0 | 178 | 90.8 | 84 | 97.7 | 76 | 74.5 | 77 | 86.5 |
| Hired | 140 | 22.9 | 2 | 0.6 | 148 | 36.1 | 47 | 30.1 | 13 | 5.3 | 1 | 1.8 | 10 | 5.1 | 1 | 1.2 | – | | – | |
| Transferred in | 7 | 1.1 | 9 | 2.8 | 26 | 6.3 | 2 | 1.3 | 1 | 0.4 | 3 | 5.3 | 8 | 4.1 | 1 | 1.2 | 26 | 25.5 | 12 | 13.5 |
| Total | 611 | 99.9 | 325 | 100.0 | 410 | 100.0 | 156 | 100.0 | 243 | 99.9 | 57 | 100.1 | 196 | 100.0 | 86 | 100.1 | 102 | 100.0 | 89 | 100.0 |
| ***Unskilled (labourers only) | | | | | | | | | | | | | | | | | | | | |
| Restarted from ROS | 64 | 16.1 | 26 | 100.0 | 293 | 83.7 | 103 | 38.4 | 165 | 100.0 | 30 | 100.0 | 81 | 82.7 | 38 | 100.0 | 28 | 80.0 | 45 | 84.9 |
| Hired | 330 | 82.9 | – | – | 49 | 14.0 | 165 | 61.6 | – | – | – | – | 1 | 1.0 | – | – | – | – | 1 | 1.9 |
| Transferred in | 4 | 1.0 | – | – | 8 | 2.3 | – | – | – | – | – | – | 16 | 16.3 | – | – | 7 | 20.0 | 7 | 13.2 |
| Total | 398 | 100.0 | 26 | 100.0 | 350 | 100.0 | 268 | 100.0 | 165 | 100.0 | 30 | 100.0 | 98 | 100.0 | 38 | 100.0 | 35 | 100.0 | 53 | 100.0 |
| Clerical & Supervisory | | | | | | | | | | | | | | | | | | | | |
| Restarted from ROS | 2 | 16.7 | 1 | 33.3 | – | – | – | – | – | – | 11 | 73.3 | 12 | 92.3 | 8 | 100.0 | – | – | – | – |
| Hired | 9 | 75.0 | 2 | 66.7 | 18 | 90.0 | 12 | 92.3 | 14 | 93.3 | – | – | – | – | – | – | 17 | 100.0 | 10 | 90.9 |
| Transferred in | 1 | 8.3 | – | – | 2 | 10.0 | 1 | 7.7 | 1 | 6.7 | 4 | 26.7 | 1 | 7.7 | – | – | – | – | 1 | 9.1 |
| Total | 12 | 100.0 | 3 | 100.0 | 20 | 100.0 | 13 | 100.0 | 15 | 100.0 | 15 | 100.0 | 13 | 100.0 | 8 | 100.0 | 17 | 100.0 | 11 | 100.0 |

*Reduction of Staff

**Apprentices omitted to avoid bias in favour of transfers in.

***Boys omitted to avoid bias in favour of hirings.

AB = Absolute

% = Percentage

APPENDIX 3

Breakdown of Separations by Skill Groups, 1953–1962

| | 1953 | | 1954 | | 1955 | | 1956 | | 1957 | | 1958 | | 1959 | | 1960 | | 1961 | | 1962 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % | AB | % |
| Skilled | | | | | | | | | | | | | | | | | | | | |
| Laid off | 1,988 | 88.6 | 928 | 82.9 | 419 | 73.6 | 691 | 81.8 | 701 | 82.2 | 683 | 83.7 | 505 | 80.9 | 316 | 70.1 | 168 | 60.0 | 377 | 81.6 |
| Resigned | 105 | 4.7 | 29 | 2.6 | 42 | 7.4 | 44 | 5.2 | 53 | 6.2 | 18 | 2.2 | 20 | 3.2 | 21 | 4.7 | 9 | 3.2 | 12 | 2.6 |
| Transferred | 7 | 0.3 | 26 | 2.3 | 5 | 0.9 | 13 | 1.5 | 8 | 0.9 | 4 | 0.5 | 8 | 1.3 | 3 | 0.7 | 5 | 1.8 | 2 | 0.4 |
| Retired | 110 | 4.9 | 113 | 10.1 | 85 | 14.9 | 86 | 10.2 | 73 | 8.6 | 85 | 10.4 | 69 | 11.1 | 96 | 21.3 | 84 | 30.0 | 61 | 13.2 |
| Deceased | 26 | 1.2 | 19 | 1.7 | 18 | 3.2 | 11 | 1.3 | 18 | 2.1 | 22 | 2.7 | 22 | 3.5 | 15 | 3.3 | 14 | 5.0 | 10 | 2.2 |
| Dismissed | 7 | 0.3 | 4 | 0.4 | – | – | – | – | – | – | 4 | 0.5 | – | – | – | – | – | – | – | – |
| Total | 2,243 | 100.0 | 1,119 | 100.0 | 569 | 99.8 | 845 | 100.0 | 853 | 100.0 | 816 | 100.1 | 624 | 100.0 | 451 | 100.1 | 280 | 100.0 | 462 | 100.0 |
| *Semi-Skilled (helpers only) | | | | | | | | | | | | | | | | | | | | |
| Laid off | 674 | 83.5 | 268 | 72.0 | 109 | 64.1 | 214 | 69.5 | 279 | 78.2 | 267 | 81.4 | 230 | 75.9 | 108 | 70.1 | 65 | 67.7 | 78 | 69.0 |
| Resigned | 91 | 11.3 | 56 | 15.1 | 23 | 13.5 | 54 | 17.5 | 41 | 11.5 | 19 | 5.8 | 27 | 8.9 | 13 | 8.4 | 4 | 4.2 | 3 | 2.7 |
| Transferred | 5 | 0.6 | 3 | 0.8 | 2 | 1.2 | 6 | 1.9 | 3 | 0.8 | 2 | 0.6 | 1 | 0.3 | 3 | 1.9 | 2 | 2.1 | 5 | 4.4 |
| Retired | 24 | 3.0 | 35 | 9.4 | 24 | 14.1 | 28 | 9.1 | 23 | 6.4 | 24 | 7.3 | 31 | 10.2 | 19 | 12.3 | 20 | 20.8 | 20 | 17.7 |
| Deceased | 10 | 1.2 | 10 | 2.7 | 12 | 7.1 | 6 | 1.9 | 10 | 2.8 | 14 | 4.3 | 13 | 4.3 | 11 | 7.1 | 5 | 5.2 | 7 | 6.2 |
| Dismissed | 3 | 0.4 | – | – | – | – | – | – | 1 | 0.3 | 2 | 0.6 | 1 | 0.3 | – | – | – | – | – | – |
| Total | 807 | 100.0 | 372 | 100.0 | 170 | 100.0 | 308 | 99.9 | 357 | 100.0 | 328 | 100.0 | 303 | 99.9 | 154 | 99.8 | 96 | 100.0 | 113 | 100.0 |
| Unskilled | | | | | | | | | | | | | | | | | | | | |
| Laid off | 510 | 79.4 | 260 | 81.8 | 14 | 22.2 | 285 | 82.6 | 125 | 68.3 | 150 | 86.7 | 94 | 71.8 | 119 | 85.0 | 52 | 83.9 | 22 | 52.4 |
| Resigned | 98 | 15.3 | 49 | 15.4 | 39 | 61.9 | 48 | 13.9 | 43 | 23.5 | 11 | 6.4 | 23 | 17.6 | 13 | 9.3 | 4 | 6.5 | 4 | 9.5 |
| Transferred | 4 | 0.6 | 2 | 0.6 | – | – | – | – | 1 | 0.5 | 1 | 0.6 | – | – | – | | – | | 9 | 21.4 |
| Retired | 13 | 2.0 | 4 | 1.3 | 9 | 14.3 | 8 | 2.3 | 10 | 5.5 | 6 | 3.5 | 9 | 6.9 | 6 | 4.3 | 3 | 4.8 | 6 | 14.3 |
| Deceased | 10 | 1.6 | 2 | 0.6 | 1 | 1.6 | 4 | 1.2 | 3 | 1.6 | 4 | 2.3 | 4 | 3.1 | 2 | 1.4 | 3 | 4.8 | 1 | 2.4 |
| Dismissed | 7 | 1.1 | 1 | 0.3 | – | – | – | – | 1 | 0.5 | 1 | 0.6 | 1 | 0.8 | – | – | – | – | – | – |
| Total | 642 | 100.0 | 318 | 100.0 | 63 | 100.0 | 345 | 100.0 | 183 | 99.9 | 173 | 100.1 | 131 | 100.2 | 140 | 100.0 | 62 | 100.0 | 42 | 100.0 |
| Clerical & Supervisory | | | | | | | | | | | | | | | | | | | | |
| Laid off | 5 | 14.7 | 4 | 9.3 | – | – | 1 | 2.5 | 3 | 12.0 | – | – | 1 | 3.1 | 1 | 2.4 | 4 | 13.8 | – | – |
| Resigned | 9 | 26.5 | 14 | 32.6 | 7 | 26.9 | 17 | 42.5 | 11 | 44.0 | – | – | 15 | 46.9 | 18 | 42.9 | 6 | 20.7 | 9 | 24.3 |
| Transferred | 2 | 5.9 | 1 | 2.3 | 4 | 15.4 | 3 | 7.5 | 1 | 4.0 | – | – | 1 | 3.1 | 4 | 9.5 | 1 | 3.4 | 2 | 5.4 |
| Retired | 13 | 38.2 | 17 | 39.5 | 11 | 42.3 | 14 | 35.0 | 8 | 32.0 | 6 | 50.0 | 12 | 37.5 | 17 | 40.5 | 15 | 51.7 | 20 | 54.1 |
| Deceased | 5 | 14.7 | 7 | 16.3 | 4 | 15.4 | 5 | 12.5 | 2 | 8.0 | 4 | 33.3 | 3 | 9.4 | 2 | 4.8 | 3 | 10.3 | 6 | 16.2 |
| Dismissed | – | – | – | – | – | – | – | – | – | – | 2 | 16.7 | – | – | – | – | – | – | – | – |
| Total | 34 | 100.0 | 43 | 100.0 | 26 | 100.0 | 40 | 100.0 | 25 | 100.0 | 12 | 100.0 | 32 | 100.0 | 42 | 100.1 | 29 | 99.9 | 37 | 100.0 |

* Apprentices omitted to avoid bias in favour of "Transfer out".

AB = Absolute

% = Percentage

# APPENDIX 4

## Rates of Turnover by Occupation, 1953–1961, Calculated per 100

$$T = \frac{EA \quad ES^*}{N}$$

* T Means rate of turnover
EA Means # of ocassions
ES Means # of Separation
N Means average number employed in this group

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | Mean | Wastage Rate[1] | Year of Starting at Wastage Rate by Extrapolating Trend Line[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Skilled | | | | | | | | | | | | |
| Machinists | 16.9 | 36.2 | 13.5 | 4.6 | 7.4 | 16.9 | 25.3 | 13.0 | 16.8 | 16.7 | 4.4 | $\bar{Y}yx$ , $byx^2$ |
| Blacksmiths | 16.5 | 3.3 | 4.3 | 7.8 | 4.7 | 27.1 | 23.3 | 5.6 | 18.8 | 12.4 | 5.8 | $\bar{Y}yx$ , byx |
| Boilermakers | 8.9 | 78.2 | 64.3 | 12.0 | 47.1 | 15.1 | 24.1 | 59.5 | 37.1 | 38.5 | 7.7 | $\bar{Y}yx$ , byx |
| Sheet-metal workers | 94.6 | 81.5 | 108.5 | 104.0 | 92.3 | 36.9 | 76.6 | 63.0 | 37.2 | 77.2 | 5.9 | 1966–67 |
| Electricians | 101.4 | 58.3 | 38.5 | 16.4 | 23.7 | 16.7 | 27.8 | 30.9 | 20.5 | 37.1 | 6.9 | 1960–61 |
| Carmen | 133.0 | 82.9 | 61.7 | 61.1 | 73.0 | 71.4 | 81.5 | 59.6 | 42.3 | 74.1 | 6.8 | 1968–69 |
| Pipefitters | 77.3 | 50.0 | 25.0 | 14.0 | 11.9 | 15.1 | 37.5 | 38.0 | 18.8 | 32.0 | 7.0 | 1961–62 |
| Moulders | 13.9 | 10.3 | 3.2 | 3.0 | 14.3 | 42.9 | 4.3 | 46.2 | 480.0 | 68.7 | | |
| Painters | 98.7 | 122.4 | 55.5 | 71.2 | 75.6 | 25.5 | 48.2 | 38.6 | 20.4 | 61.8 | 4.7 | 1962 |
| Upholsterers | 192.8 | 222.6 | 152.7 | 265.7 | 285.7 | 126.1 | 29.4 | 200.0 | 32.3 | 167.5 | 5.6 | |
| Seamstresses | 222.2 | 185.7 | 175.0 | 250.0 | 240.0 | 133.3 | 140.0 | 33.3 | 100.0 | 164.4 | | |
| Total | 54.4 | 37.1 | 19.9 | 26.2 | 29.2 | 33.8 | 28.7 | 24.5 | 15.9 | 30.0 | | |
| Helpers | 77.8 | 53.9 | 42.3 | 33.9 | 50.5 | 35.2 | 51.3 | 29.5 | 27.2 | 44.6 | 5.8 | 1964–65 |
| Apprentices | 47.1 | 73.6 | 91.1 | 90.2 | 76.4 | 81.6 | 109.6 | 106.1 | 84.2 | 84.4 | | |
| Labourers | 94.7 | 42.1 | 49.7 | 68.5 | 41.1 | 26.2 | 29.8 | 28.8 | 17.1 | 44.2 | 3.8 | 1962 |
| Boys | 100.0 | 54.5 | 188.8 | 287.5 | 137.5 | 112.5 | 283.3 | 75.0 | 280.0 | 168.8 | | |
| Clerks | 26.5 | 23.7 | 36.6 | 35.5 | 31.9 | 17.7 | 34.7 | 34.4 | 33.0 | 30.4 | | |
| Foremen | 9.0 | 12.7 | 6.8 | 11.7 | 6.5 | 6.1 | 7.5 | 12.2 | 11.5 | 9.3 | | |
| Miscellaneous | 11.5 | 37.1 | 4.5 | 10.4 | 3.2 | 15.0 | 16.4 | 16.1 | 24.0 | 15.4 | | |

[1] The "normal wastage rate" has been calculated as the average rate of turnover resulting from resignation, deaths and dismissals. The years included for averaging purposes have been 1957 through 1961. Earlier years have been excluded because of the high rate of lay-offs in those years because of cyclical factors. Including the earlier years would have biased the wastage rate upwards because of the strong tendency for resignations to be positively affected by the lay-off rate.

[2] The years or starting at normal rate has not been included for machinists, blacksmiths and boilermakers because of the high standard of error in the regression coefficient. Please see footnote 3, p. 105A.

[3] Please see p. 104 for the meaning and significance of the entries in this colum.

## APPENDIX 5

Trend Equations for Rates of Turnover in Occupational Groups, 1953–1961
Type = X (Years 1, 2, 3, ..... 9 covering each year 1953 through 1961)

| Occupational Group Symbol | Occupational Group | Regression Equation a byx | Standard Error of the Regression Coefficient Syx | Partial Correlation Coefficient rxy (Time and rate of turnover) | Coefficient of Determination $r^2xy$ |
|---|---|---|---|---|---|
| $Y_2$ | Machinists ..... | $Y_2 = 19.58 - 0.57X$ | 1.28 | - 0.17 | 0.03 |
| $Y_3$ | Blacksmiths ..... | $Y_3 = 6.26 + 1.22X$ | 1.17 | + 0.37 | 0.13 |
| $Y_4$ | Boilermakers..... | $Y_4 = 40.19 - 0.34X$ | 3.48 | - 0.04 | 0.00 |
| $Y_5$ | Sheet-metal workers..... | $Y_5 = 111.84 - 6.9X$ | 2.58 | - 0.71 | 0.51 |
| $Y_6$ | Electricians ..... | $Y_6 = 72.71 - 7.12X$ | 2.66 | - 0.71 | 0.51 |
| $Y_7$ | Carmen..... | $Y_7 = 106.00 - 6.38X$ | 2.54 | - 0.69 | 0.47 |
| $Y_8$ | Pipefitters..... | $Y_8 = 52.28 - 4.07X$ | 2.53 | - 0.52 | 0.27 |
| $Y_9$ | Moulders..... | $Y_9 = -99.17 + 33.57X$ | 17.24 | + 0.59 | 0.35 |
| $Y_{10}$ | Painters ..... | $Y_{10} = 113.86 - 10.42X$ | 2.49 | - 0.85 | 0.71 |
| $Y_{11}$ | Upholsterers..... | $Y_{11} = 258.81 - 18.27X$ | 10.65 | - 0.54 | 0.30 |
| $Y_{12}$ | Seamstresses ..... | $Y_{12} = 258.78 - 18.88X$ | 6.63 | - 0.73 | 0.54 |
| $Y_{15}$ | Helpers ..... | $Y_{15} = 65.98 - 4.27X$ | 1.47 | - 0.74 | 0.55 |
| $Y_{16}$ | Apprentices ..... | $Y_{16} = 61.57 + 4.57X$ | 1.90 | + 0.67 | 0.45 |
| $Y_{20}$ | Labourers ..... | $Y_{20} = 80.28 - 7.22X$ | 1.93 | - 0.82 | 0.67 |
| $Y_{21}$ | Boys ..... | $Y_{21} = 102.50 + 13.26X$ | 11.97 | + 0.39 | 0.15 |
| $Y_{23}$ | Clerks ..... | $Y_{23} = 27.40 + 0.61X$ | 0.86 | 0.26 | 0.07 |
| $Y_{24}$ | Foremen ..... | $Y_{24} = 8.98 + 0.07X$ | 0.37 | 0.07 | 0.01 |
| $Y_{25}$ | Miscellaneous ..... | $Y_{25} = 14.07 + 0.26X$ | 1.42 | 0.07 | 0.00 |

## APPENDIX 6

Ratio of Resignations to Total Employees by Skill Groups, 1953–1962

$$\frac{\text{\# Resignations Year X}}{\text{\# Av. Employed Year X}}$$

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| Skilled ..... | 2.5 | 1.0 | 1.5 | 1.4 | 1.8 | 0.7 | 0.9 | 1.1 | 0.5 | 1.3 |
| Semi-skilled ..... | 5.0 | 4.3 | 1.7 | 4.0 | 3.4 | 1.7 | 2.8 | 1.6 | 0.5 | 2.8 |
| Unskilled ..... | 8.9 | 5.9 | 4.7 | 5.3 | 5.0 | 1.4 | 3.0 | 2.1 | 0.7 | 4.1 |
| Clerical & supervisory | 2.9 | 5.0 | 2.6 | 6.4 | 4.2 | – | 5.9 | 7.7 | 2.7 | |

APPENDIX 7

Ratio of Retirements to Total Employees
by Skill Groups, 1953–1961

$$\frac{\#\ \text{Rs Year X}}{\#\ \text{N}} = \text{X}$$

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 |
|---|---|---|---|---|---|---|---|---|---|
| Skilled | 2.7 | 3.7 | 3.0 | 2.7 | 2.5 | 3.5 | 3.2 | 5.2 | 4.8 |
| Semi-skilled | 1.3 | 2.7 | 1.8 | 2.0 | 1.9 | 2.1 | 3.2 | 2.3 | 2.7 |
| Unskilled | 1.2 | 0.5 | 1.1 | 0.9 | 1.2 | 0.8 | 1.2 | 1.0 | 0.5 |
| Clerical & supervisory | 4.2 | 6.1 | 4.1 | 5.3 | 3.1 | 2.3 | 4.7 | 7.2 | 6.7 |

## APPENDIX 8

### Lay-Off Experience of Pre-1953 Boilermakers

| Col. 1 | Col. 2 | Col. 3 | Col. 4 | Col. 5 | Col. 6 |
|---|---|---|---|---|---|
| Number of boilermakers on the Angus seniority list, January 1953 | Boilermakers hired before 1953 and currently working at their craft in Angus | Number of pre-1953 boilermakers currently working at their craft at other points | Number of pre-1953 boilermakers now working at a lower status at Angus | Number of pre-1953 boilermakers now working at a lower status at other points | Number of pre-1953 boilermakers who experienced temporary demotion to helpers |
| 143 | 56 | 0 | 0 | 5 | 19 |

| Col. 7 | Col. 8 | Col. 9 | Lay-off experience of pre-1953 boilermakers | | | |
|---|---|---|---|---|---|---|
| Number of pre-1953 boilermakers still working who experienced no lay-off | Number of pre-1953 boilermakers not now at Angus who experienced no lay-off | Number of pre-1953 boilermakers who experienced lay-off | 3 months | 3 6 months | 6 9 months | 9 months |
| 34 | 63 | 46 | 13 | 17 | 10 | 12 |

(counting workers only once in a period who were held off more than once for that classified time period)

18 17 10 14
(total number of lay-offs for each period)

### Lay-off Experience of Post-1953 Boilermakers

| Number of boilermakers hired at Angus since, January 1953 | Col. 2 | Col. 3 | Col. 4 | Col. 5 | Col. 7 | Col. 8 | Col. 9 |
|---|---|---|---|---|---|---|---|
| | (Column headings are similar to those drawn up for Boilermakers on Angus roll before January 1, 1953 except that they relate to Boilermakers taken on the Angus roll since January 1, 1953) | | | | | | |
| 17 | 2 | 2 | 0 | 1 | 4 | 0 | 7 |

1 2 2 6
(total number of lay-offs for each period)

APPENDIX 9

Lay-Off Experience of the 19 Boilermakers now Employed at Angus who Experienced Lay-Off Between January 1953 and July 1963

| Date of Birth | Date of Seniority as Boilermaker | Period 1 | | | Period 2 | | | Period 3 | | | Period 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1921 | June 1955 | Ap. 24, 1954 | May 28, 1955 | $13^{5}$ | Jan. 4, 1957 | Sept. 16, 1957 | $9^{12}$ | Nov. 15, 1957 | Dec. 16, 1957 | $1^{2}$ | Jan. 13, 1958 | June 10, 1963 | $65^{28}$ |
| 1909 | Feb. 1948 | Ap. 21, 1954 | May 30, 1954 | $13^{10}$ | Ap. 1, 1957 | Aug. 19, 1957 | $4^{19}$ | | | | Oct. 29, 1957 | Ap. 16, 1962 | $53^{18}$ |
| 1922 | Dec. 1944 | Ap. 20, 1954 | Ap. 22, 1955 | $12^{3}$ | July 3, 1957 | Dec. 17, 1957 | $5^{14}$ | | | | Jan. 13, 1958 | Ap. 16, 1962 | $51^{2}$ |
| | | | | | | | | Nov. 18, 1957 | Dec. 13, 1957 | $0^{26}$ | Jan. 13, 1958 | May 29, 1959 | $16^{11}$ |
| 1922 | Ap. 1944 | Ap. 21, 1954 | Ap. 22, 1955 | $12^{2}$ | | | | | | | March 24, 1960 | Ap. 9, 1962 | $24^{17}$ |
| 1917 | Jan. 1941 | June 16, 1954 | March 2, 1955 | $8^{16}$ | July 8, 1957 | Aug. 19, 1957 | $1^{12}$ | Nov. 20, 1957 | Dec. 13, 1957 | $0^{24}$ | Jan. 13, 1958 | Feb. 13, 1962 | $49^{1}$ |
| 1917 | Dec. 1940 | June 16, 1954 | Feb. 22, 1955 | $8^{7}$ | | | | Nov. 29, 1957 | May 27, 1959 | $17^{29}$ | Oct. 29, 1959 | Feb. 7, 1962 | $27^{9}$ |
| 1900 | Oct. 1940 | Sept. 1, 1954 | Feb. 16, 1955 | $5^{16}$ | | | | Nov. 29, 1957 | Ap. 3, 1959 | $16^{5}$ | Oct. 24, 1959 | Nov. 2, 1961 | $24^{9}$ |
| | | | | | | | | | | | Jan. 13, 1958 | May 1958 | $4^{15}$ |
| 1917 | Oct. 1940 | Sept. 1, 1954 | Feb. 14, 1955 | $5^{14}$ | | | | Oct. 28, 1957 | Dec. 23, 1957 | $1^{27}$ | Nov. 5, 1958 | March 2, 1959 | $3^{28}$ |
| | | | | | | | | | | | Nov. 5, 1958 | Feb. 23, 1959 | $3^{19}$ |
| 1918 | Sept. 1940 | | | | | | | Nov. 22, 1957 | July 8, 1958 | $7^{17}$ | Oct. 24, 1959 | Jan. 2, 1962 | $26^{9}$ |
| 1917 | June 1940 | Sept. 1, 1954 | June 1, 1955 | $9^{1}$ | | | | Nov. 18, 1957 | March 2, 1959 | $15^{14}$ | March 23, 1960 | May 15, 1961 | $13^{23}$ |
| 1913 | Dec. 1938 | Sept. 1, 1954 | Jan. 6, 1955 | $4^{5}$ | | | | Feb. 3, 1958 | July 8, 1958 | $5^{2}$ | March 27, 1960 | May 4, 1961 | $13^{11}$ |
| 1914 | Nov. 1938 | Sept. 1, 1954 | Jan. 25, 1955 | $4^{24}$ | | | | Feb. 3, 1958 | July 7, 1958 | $5^{1}$ | March 23, 1960 | May 5, 1961 | $13^{12}$ |
| 1911 | July 1937 | Sept. 1, 1954 | Jan. 4, 1955 | $4^{3}$ | | | | | | | March 23, 1960 | Feb. 14, 1961 | $11^{9}$ |
| 1910 | June 1935 | Aug. 31, 1954 | Jan. 4, 1955 | $4^{4}$ | | | | | | | March 1, 1960 | Feb. 13, 1961 | $11^{15}$ |
| 1913 | Feb. 1935 | Sept. 1, 1954 | Jan. 3, 1955 | $4^{2}$ | | | | | | | May 13, 1960 | Feb. 7, 1961 | $9^{25}$ |
| 1909 | Sept. 1934 | Sept. 1, 1954 | Jan. 3, 1955 | $4^{2}$ | | | | | | | May 13, 1960 | Feb. 7, 1961 | $9^{25}$ |
| 1910 | May 1934 | | | | | | | | | | May 13, 1960 | Nov. 21, 1960 | $6^{9}$ |
| 1910 | Oct. 1933 | | | | | | | | | | May 13, 1960 | Nov. 21, 1960 | $6^{9}$ |
| 1910 | Ap. 1933 | | | | | | | | | | Jan. 1, 1960 | Nov. 17, 1960 | $5^{17}$ |

## APPENDIX 10

### Questions Put to Interviewees

1. Was the possibility raised by the Management or the Union for you to work temporarily at another CPR shop outside Angus so that you could have avoided layoff?

   If the answer is 'Yes', why did you not accept it to avoid layoff?

2. Was the possibility raised by the Management or the Union for you to work temporarily inside Angus at a job other than a boilermaker job so that you could have avoided layoff?

   If the answer is 'Yes', why did you not accept it to avoid layoff?

3. If it was open to you to work temporarily at another job inside Angus would you accept it in preference to being laid off?
   1. If it meant working as a boilermaker's helper.
   2. If it meant working as a helper in another craft.
   3. If it meant working as a labourer.

   If the answer is 'No' in any of these cases, then say why not.

4. Have there been occasions when you have accepted temporary work at St. Luc or some other CPR shop outside Angus so that you were not laid off on these occasions?

   If the answer is 'Yes', how many times has this happened?

   To what job?

5. Did you work while on layoff? Name of company

   Type of work or occupation

   Rate of pay.

6. When you were unemployed what was your source of income? Did your family have any other source of income?

7. Were you offered recall to temporary work at Angus while you were on layoff but turned it down?

   If the answer is 'Yes', then say why.

8. If you were employed outside when you were recalled:

   a) Why did you return to Angus?

   b) Were you having higher wages outside?

   c) What type of work were you doing?

9. If you were employed in a temporary position at St. Luc or some other CPR seniority point as a boilermaker while you were on layoff from Angus would you want to return to Angus when a job (of reasonable permanence) became available there?

    a) If you were recalled to Angus to work as a boilermaker.

    b) If you were recalled to Angus to work as a boilermaker's helper.

    c) If you were recalled to Angus to work as a helper in another craft.

    d) If you were recalled to Angus to work as a labourer.

10. Would you be prepared to take the training necessary for another job, including another craft while you were on layoff if, during your training period, your income was maintained in the form of unemployment insurance?

    If the answer is 'Yes', say what job or craft you would choose.

11. What positions were you offered by the UIC when you were on layoff?

12. What positions did the Union tell you were open to you when you were on layoff?

13. What steps did you take to try and get a job during your layoff?

14. What sources of information did you rely on for information on jobs?

15. While you were on layoff, did you participate in any schemes to change your job potential? e.g., International Correspondence Schools' Courses; Provincial Vocational Training Courses.